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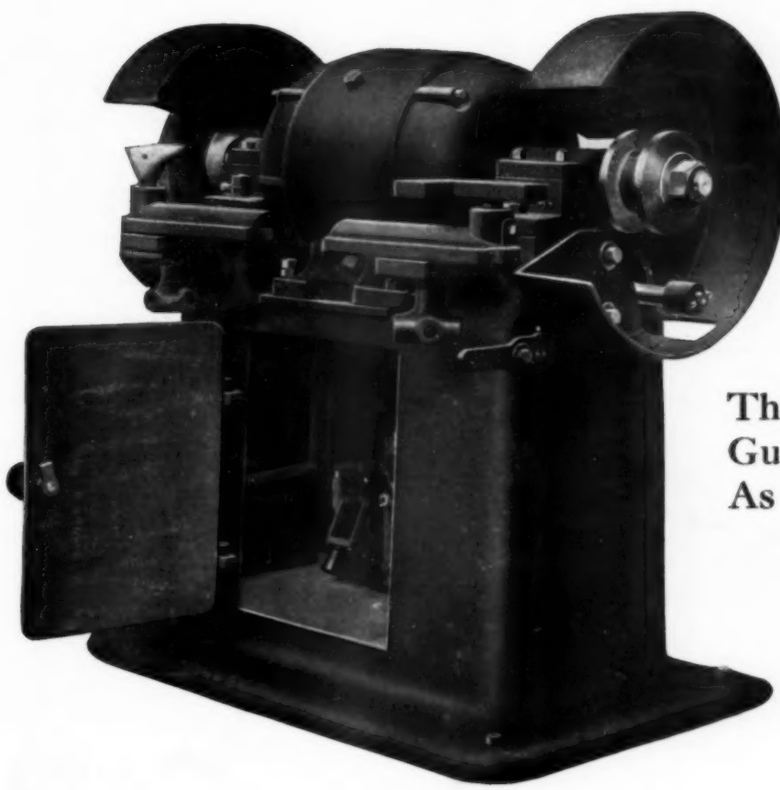

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Heavy springs are placed at the necessary points to secure the proper elasticity.

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Regularly equipped with foot treadle, but can also be equipped with hand lever without additional charge.

Built in 11 sizes for steam or compressed air.

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(*See pages* 43, 44, 45 and 46)

Features of the New Triumph Plant

By F. A. Stanley *

A modern establishment of brick and steel, devoted to the building of electrical equipment and ice machinery. Interior arrangement of three-story building with saw-tooth roof for handling both light and heavy work.

Heavy machining operations carried out by means of a system of floor plates and a combination portable machine tool for drilling, boring, milling and planing.

*Western editor.

The main building of the new plant of the Triumph Electric and Ice companies at Oakley, Cincinnati, Ohio, is constructed principally of brick and steel, and is 300 feet long by 140 wide, three stories high, with saw-tooth roof, and with main floor of concrete. Above this floor, along either side, there are two broad galleries, leaving the center bay open to the roof, and this bay is spanned by a 25-ton traveling crane, with a 5-ton auxiliary hoist.

General Arrangement

The general appearance of the interior of the shop is well brought out by the halftone engraving, Fig. 1, which shows the heavy character of the work to which the ground floor is devoted. The east and west galleries, constituting the second floor, are taken up by the stores department, and the materials and parts here are stored directly over or under the departments which require them, thus reducing handling to a minimum. The third-story galleries are taken up with the production of light work, and like the second floor, are served with two freight elevators each, and by the traveling crane.

Several views of different departments are presented in Figs. 2 to 5 inclusive, the first of these showing one of the upper galleries devoted to the manufacture of small motors of various types. This view in conjunction with Fig. 1, gives an excellent idea of the principal internal features of construction, such as the arrangement of columns, girders, trusses, elevator runs and steel work generally, including also the skeleton elevator shafts, the stairways, the hoists and trolleys for handling work in the gallery, and various other features of interest, among them the sprinkler system for fire protection, the arrangement of lights, etc.

A detailed account of some of the manufacturing operations accomplished upon this floor will appear in a subsequent issue of the American Machinist.

Fig. 3 illustrates the armature-winding department; Fig. 4, the testing department for small motors and Fig. 5 the stores referred to in the second paragraph of this article.

Current for lighting and power, compressed air, heat and water, are supplied from the central power station of the Oakley Colony.

Floor Plate Operations

An important feature of the Triumph plant is the provision for handling certain classes of heavy work on a system of floor plates, the machining operations being accomplished by a large portable machine built by the Morton Manufacturing Company, for performing drilling, boring,

Fig. 1. General View in Shop of Triumph Electric and Ice Machine Companies

milling and draw-cutting operations. This tool is utilized extensively in machining the heavy frames of ammonia compressors for refrigeration purposes, and in Figs. 6 and 7, it is represented at work upon a 12 by 20-inch compressor frame.

This frame is of the Tangye type and is a very heavy casting. When once placed upon the floor plate it is left in fixed position during successive operations, the boring and draw-cutting machine being moved around to the different positions required to perform its work.

Machining Main Bearings

The engraving, Fig. 6, shows the method of planing out the bed for the main bearing, the cutting tool working on the drawstroke. The compressor casting is carefully leveled up, and is set in proper alinement on the floor plate, a process which is greatly facilitated by the series of planed T-slots extending the full length of the plate system, and by the heavy steel square seen in the foreground, this square having an extension below the bottom of the stock as in Fig. 8, that serves as a tongue in locating it positively against the side of any T-slot over which it happens to be convenient to use it. Thus it constitutes a ready reference point at different positions along the slot, by which the work may be easily set.

Fig. 7 also shows the setting blocks between the T-slot and the side of the casting; the jacks between the portable machine and the work; and the straps that secure the work in place. The portable tool is in this case placed with its base parallel to the work and with the ram at right angles to the casting to be planed out. The size of the compressor frame and the rigidity of the portable tool allow heavy cuts to be taken and the shaping out of the opening for the boxes and the facing at the top for the upper box require little time for execution after the work and portable machine are once set.

Boring the Cylinder Housing and Guides

The operations of boring out the opening at the end of the frame to receive the compressor cylinder, and the boring of the guides for the circular shoes of the crosshead, are represented by Fig. 7, where the portable machine tool is shown placed at the end of the casting with its base at right angles to the work. The compressor frame is set as in the planing operation, with leveling wedges under the points that will be used for leveling up the machine when it is erected. Also, for this operation, the tie rods between the cylinder housing and the guides are fitted in place so that the frame is bored out under the same conditions in this respect that will obtain when it is put into service.

With the system of T-slots and the application of the square (to which a long indicator arm may be attached) the frame to be bored is readily set with the planed seat for the main bearing boxes square with the boring bar of the portable machine. The bar is provided with boring heads for the two surfaces, namely the bore to receive the sleeve casting which forms the cylinder, and the crosshead guide. An outboard support for the boring bar is carried by the casting and by jacks placed as represented in Fig. 7. In the illustration the bar is shown withdrawn from the outer support, in order to reveal more clearly the form of the ram through which the rotary spindle and boring bar are operated.

Other Work on the Floor Plate

Another job handled on the floor plate, and one more special in its nature than the work illustrated in Figs. 6 and 7, is represented by Fig. 9, which shows the means recently adopted to finish the face of a 92-inch brush-holder yoke, a light casting of spider form, requiring a larger swing than was available among the lathes or boring mills in the shop, and making it necessary, therefore, to resort to special measures for mounting and machining the work.

Considerable surplus metal was left on the face of the ring casting to assure its finishing properly to the required thickness, and in roughing off the face the portable machine on the floor plate was used as a milling machine, with a facing cutter attached to its spindle and the work mounted upon a fixture which was supported by the large "parallel" shown standing on end in both Figs. 7 and 9. Here the casting to be rough faced, was milled across as wide an arc of the rim as the head and spindle adjustments of the machine would permit of conveniently, then the work was reset and the remainder of the face operated upon.

For finishing, the work was mounted upon the faceplate of a 60-inch lathe head, which was removed from its bed and placed upon a raising block, as in the halftone, Fig. 9. The driving cone was then belted from one of the shafts

Fig. 2. View on Third Floor Devoted to Manufacture of Small Motors

Fig. 3. Armature-winding Department

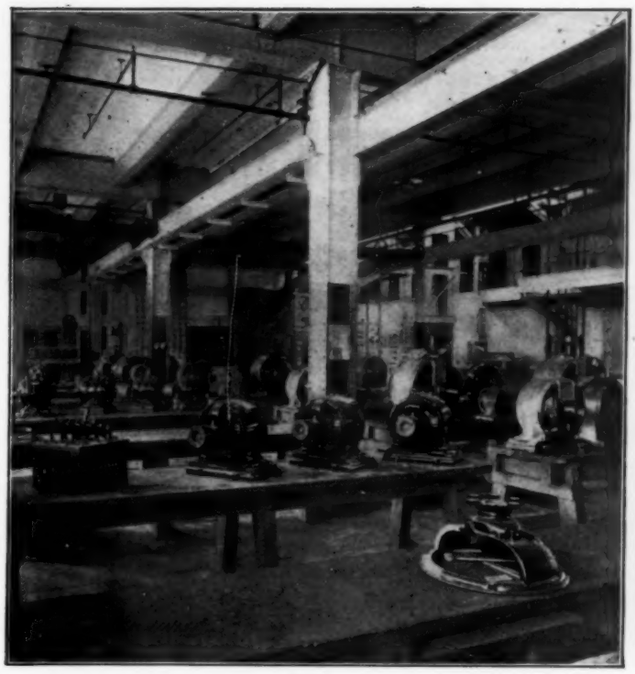

FIG. 4. TESTING DEPARTMENT FOR SMALL MOTORS

FIG. 5. STORES DEPARTMENT

at the top of the portable tool, which in this operation, was utilized for power transmission only. The facing tool for the operation was carried in a post on a lathe cross slide, jacked up to correspond in hight with the head. The tool slide will be seen at the rear of the work, and the driving belt will also be noticed crossing over the floor plate from the cone pulley of the lathe head to the small pulley near the top of the portable machine.

This illustration represents this machine from the end and shows one of the tongue slots in its base by means of which it is located squarely with the T-slots in the floor plate.

FLOOR PLATE DETAILS

A few details of the floor-plate construction should be of interest. This plate is built up of 15 sections, like Fig. 10, giving a total area of 30 by 30 feet. The castings are 10 feet long by 6 wide, and each has four longitudinal T-slots, spaced as in the drawing, the edge of the plate forming one side of another T-slot, which is completed by the edge of the adjoining section. The edges, like the top, are planed all the way round, and grooves are formed along the edges and ends for the reception of straight lengths of steel 2 by 1½ inches which are fitted in the plate joints to serve as a lining and locking keys. Two bolts 1½ diameter are fitted through each side joint and each end to draw the sections rigidly together. The oblong pockets which permit the nuts on these coupling bolts to be tightened, are seen in the plan view. The drawing shows clearly the depth of the plate, the

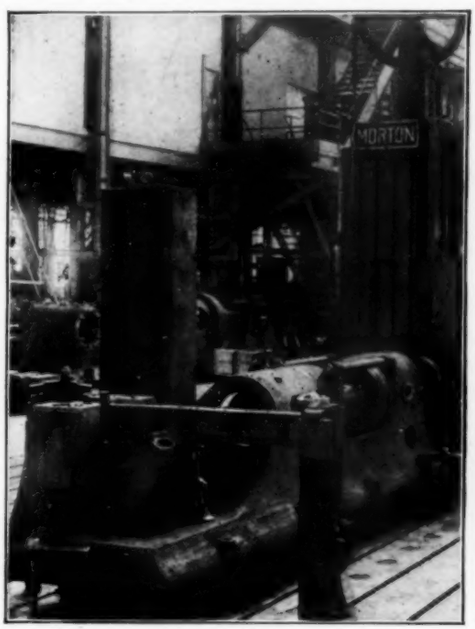

FIG. 7. BORING OPENING FOR CYLINDER AND CROSS-HEAD GUIDES

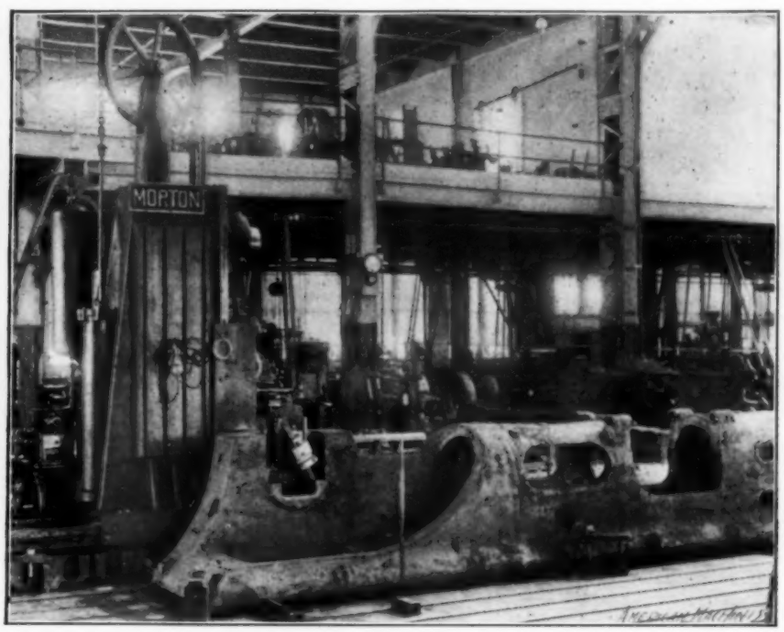

FIG. 6. PLANING OPERATION ON THE FLOOR PLATE WITH PORTABLE DRAW-CUT MACHINE

thickness of top and ribs, and also gives details of the coupling bolts and keys.

Installing the Floor Plate

In setting the floor plate, a bed of concrete was prepared and in this were bedded five permanent jacks for each of the fifteen sections, one jack for each corner of the section and the fifth for the center. A sketch of the jack used is reproduced in Fig. 11. It consists of a cast base 6 by 12 inches, with a short 1½-inch bolt tapped in, the head being chamfered to provide a suitable bearing under the plate. With these jacks the plate sections were carefully leveled, and then grouting was poured in to fill the whole affair until flush with the tops of the cored openings through the plates.

A Heavy Parallel

Reference has been made already to the large parallel shown in different views of the floor-plate work. This iron block is used for carrying various castings that are machined on the floor plate, and is found a convenient appliance upon numerous occasions. Its general dimensions are given on the sketch, Fig. 12. It weighs 9000 pounds, or 4½ tons. For convenience in handling with the crane, a strong eye-bolt is provided at one end, as represented in the photographs.

A Sling for Armatures

A convenient sling for handling armatures and induction-motor rotors, is il-

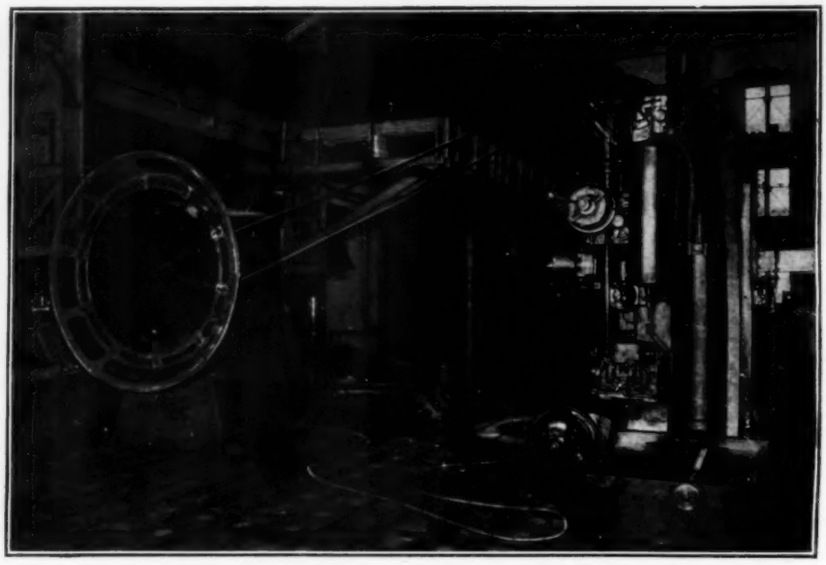

Fig. 9 A Facing Job on the Floor Plate

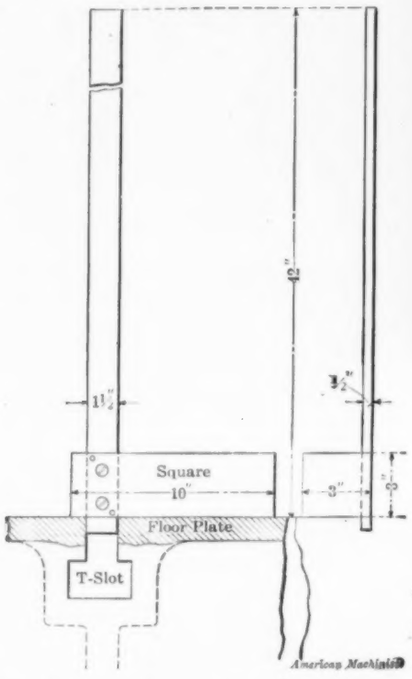

Fig. 8. Large Square Used Upon Floor Plate

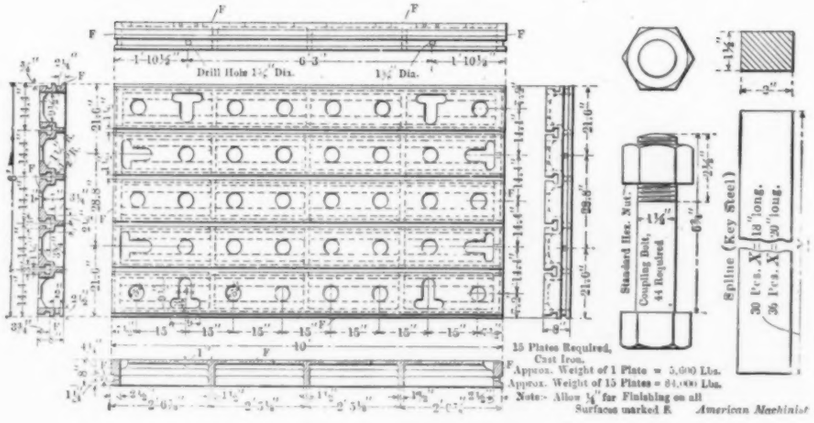
Drill Hole 1½" Dia.
1½" Dia.
Standard Hex. Nut
Coupling Bolt, 44 Required
Spline (Key Steel)
15 Plates Required, Cast Iron.
Approx. Weight of 1 Plate = 5,900 Lbs.
Approx. Weight of 15 Plates = 84,000 Lbs.
Note:- Allow ¼" for Finishing on all Surfaces marked F.
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Fig. 10. Construction of Floor Plate

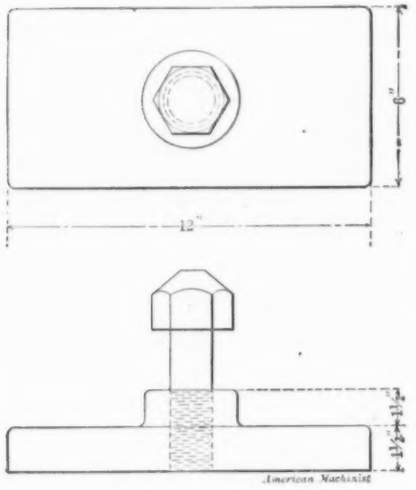


Fig. 11. Jack for Floor Plate

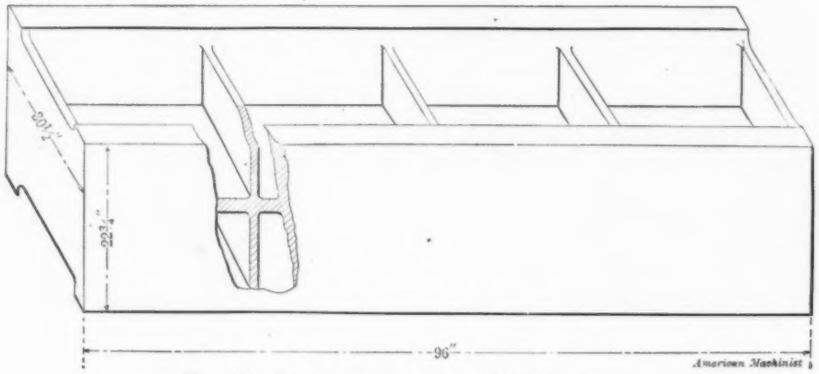


Fig. 12. Four and One-half Ton Parallel

lustrated by Fig. 13. This is a piece of two-ply leather belting, 18 inches wide riveted over strong iron loops at either end for the reception of the crane hook. Slings of this type are used from 6 to 36 inches wide, the latter being of four-ply belting and adapted to carrying armatures up to 48 inches diameter.

The slings enable work of the nature referred to, to be picked up and transported about the works without difficulty and without possibility of injury to the surfaces.

A Foreman's Order Board

In Fig. 14 a foreman's desk is shown, with a typical order board at the side that enables the workmen to go ahead with one job after another, without consulting with the foreman as to the order in which they shall be taken up. This happens to be the desk and order board in the turret-lathe department, and each section of the board is devoted to a certain class of work, distinguished either by the character of the pieces themselves or by the type of machine upon which they are produced. This feature is indicated by the headings over the eight columns of order slips.

The position of the slips in any column denotes the order of precedence. The uppermost order in any division is the one to be attended to first, and as the name or shop number of the parts required, together with the quantity wanted, is typewritten plainly at the top of each order slip, the man going up to the board for a fresh job can see at once what is wanted first in that particular classification with which he is concerned.

It will be noticed that there are a number of gaps in the columns of order slips on the board. This is due to the fact that the foreman frequently advances one order over another, to meet some situation arising after the original grouping of the slips, and in such cases he has merely to remove any order that is to be hurried along and place it at the top of its particular column. Where a gap of several numbers appears it is evident that a corresponding number of slips have been placed one after another at the head of the column, and the work they called for completed.

For the sake of appearances the order slips on the whole board are at frequent intervals rearranged to start at the head of the board and close up all gaps in the series, but this is not essential to the proper operation of the system, as the uppermost slip in each column is the one to receive attention first, whether the slips happen to start at the top or half way down the line.

Fig. 13. Armature Sling

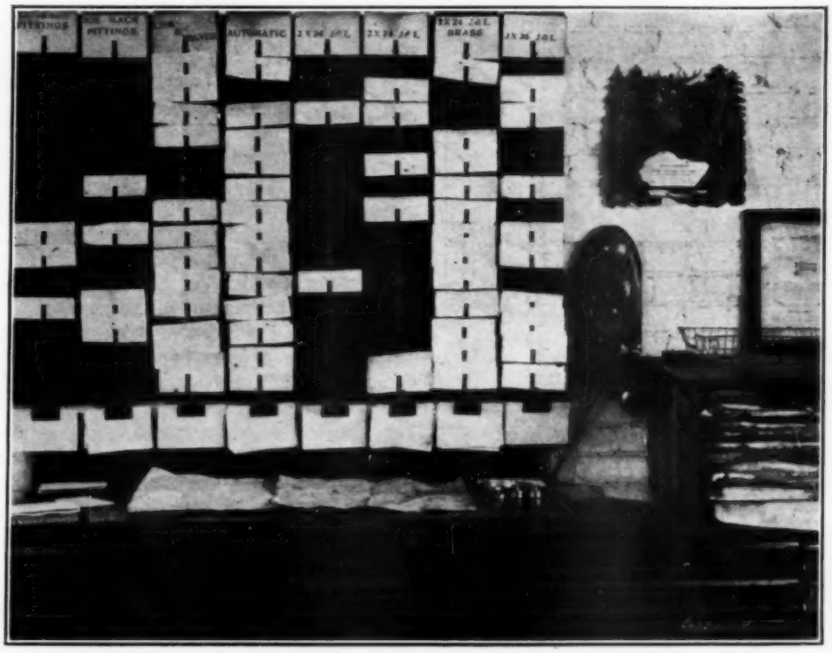


Fig .14. Foreman's Desk, Order Board and Case

The Home Influence of Shop Systems

By John R. Godfrey

We used to be very fond of deluding ourselves that there was no such thing as sentiment in business, even before the present inoculation of the efficiency germ, but a remark of a successful employer in a small town indicates that sentiment may take several different ways of showing itself.

I had just asked him about the problem of getting good men to come to the small town, and he volunteered the information that he never felt sure of a married man until he knew his wife liked the town, then you couldn't drive him away with a club.

So he set about organizing clubs and in other ways making the town attractive to the wives and mothers. And after this was done he had no trouble in keeping any man whose wife did not long for a larger town, unless the man is of the same disposition.

To quote the aforementioned employer: "A man's wife can upset any efficiency scheme that was ever tried," meaning simply that no man could work efficiently unless his mind was at ease. All of which goes to prove that sentiment or the human element plays a very important factor, in spite of the dictum of the alleged fountainhead of all knowledge of scientific management that "in the past man has been the first consideration but in the future system must come first."

It is reported in a consular communication from Sweden that the Swedish government began in the fall of 1910 experimental production of pig iron by electricity on a scale sufficiently large to be considered of commercial magnitude and to approximate closely the conditions of actual commercial manufacture. Without good coal, and facing a rapid diminution in the supply of wood available for charcoal, the Swedish iron industry has felt that its salvation lies in smelting with the cheap electric energy developed from the country's abundant water power. While secrecy still prevails regarding the operations, it is felt that the experiments have gone far to prove the practicability of the process, and it is reported that further furnaces are being planned.

A Piece of Precision Die Work

By Gustav Korinek*

Description of successful methods of originating angles and sizes in a case where the necessity for a high degree of accuracy was increased by the probability of an accumulation of errors.

*Toolmaker, The Burroughs Adding Machine Company.

The toolmakers at the works of the Burroughs Adding Machine Company, Detroit, Mich., often have interesting difficulties to overcome, and I have thought that a description of one of these pieces of work—in this case a sectional die—together with the methods by which the work was done, might be of interest to the readers of the AMERICAN MACHINIST.

THE WORK TO BE DONE

A die of a high degree of accuracy and of the character shown in Fig. 1 was required, the piece to be punched performing some important functions in the adding machine. In the finished work all the dimensions of importance must come within 0.0005 inch of the given dimension, and, as there were seventeen sectional tapered blocks *A A* to be made, it is obvious that the chance for the accumulation of errors was great.

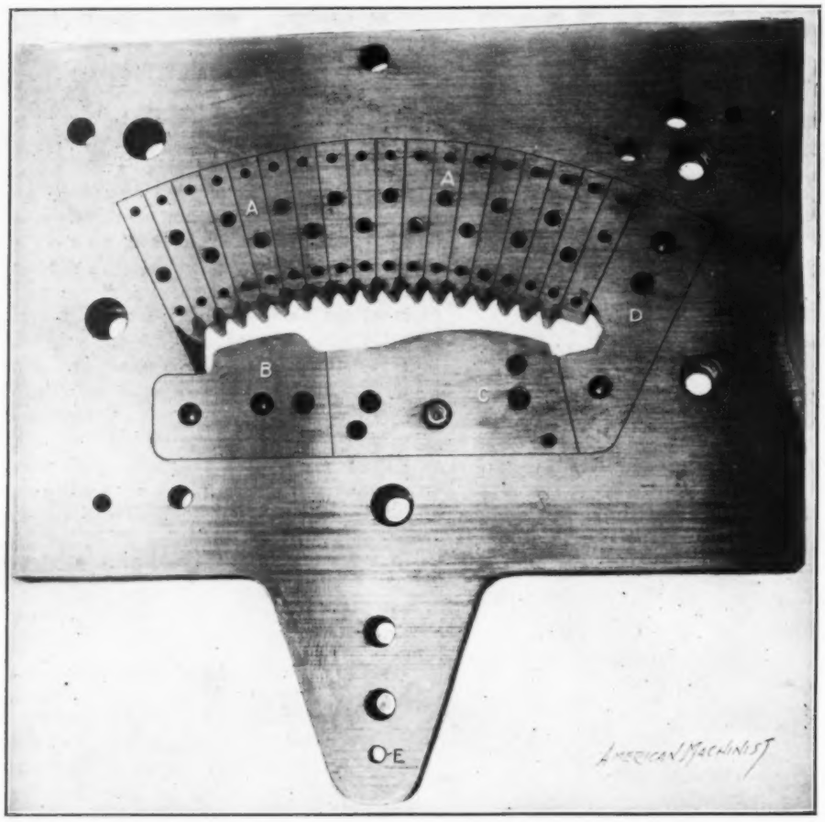


FIG. 1. THE COMPLETE DIE

The other blocks, *B*, *C* and *D*, were easily made and fitted into place, being bottomed in a recess cut in the machine steel die plate proper, which completely surrounds and carries the individual sections. The center of the fixed radius of the gear teeth was located on an arm on one side at *E*, which aided materially in laying out the work.

This article relates chiefly to the method of making the tapered block pieces, which obviously involved some method by which they could be made not only exact duplicates, but of the exact size and angle called for in the drawing. At the start it should be said that the die makers are given every assistance by the tool designers, all of the dimensions of the individual blocks being furnished on the drawings. The taper of the sections, for example, was given by the diameters of two circles of 0.4002 and 0.3262 inch diameter respectively, at a distance between centers of 1.53125 inches, as shown in Fig. 2.

The shape of the teeth was first rough milled along the edge of a tool-steel bar long enough to make the seventeen blocks. The finishing cut was made by an accurate fly cutter held in the spindle, which was blocked, the cut being taken by feeding the table by hand, the cut taken being a planing cut.

The bar was then cut into the required number of pieces, enough stock being left on the sides for finishing. Each section then had a centering hole drilled in the end opposite the tooth. The dowel and screw holes were then drilled, and, after tapping the middle holes, the pieces were hardened and tempered.

ORIGINATING THE ANGLE

Next came the grinding fixture shown in Fig. 3 for originating the angle and grinding the sides of the wedges. Two parallel rods *A B*, having a difference of diameter equal to 0.148 inch, or four times the difference of radii of the inscribed circles supplied by the drawing office as measures of the angle, were then made. The rods were located on a base plate at a distance equal to four

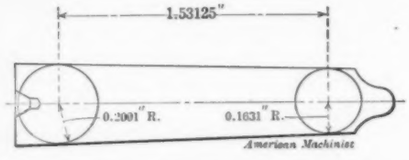


FIG. 2. THE METHOD OF DIMINISHING THE ANGLE

times that between the inscribed base circles and located in position by guard pins on each side. The lower surface of the base block *C* being first finished, it was placed on the rods and the upper surface was ground level, thus originating an angle equal to one-half that between the sides of the work.

Supports *D* and *E* for the two ends of the work were then made, the former engaging the tooth, while the latter had a nicely fitting sixty-degree center pointed pin for the center hole in the other end of the piece of work. This pin was fed forward by the head of the screw *F* and it was provided with a locking screw *G* having a small lever handle *H*. The dimensions were such that when the piece of work was placed in the fixture the surface was high enough for the grinding wheel to clear the tops of the parts *D* and *E*. When grinding the work the rods *A B* were, of course, removed, thus lowering one end of the fixture by an amount such as to originate the angle of one side of the wedge. After grinding one side of the piece it was inverted and the other side ground—a process which also insured that the tooth was exactly on the center line.

The Final Test Gage

The completion of the work was by lapping, and a final test gage and guide for this lapping operation was required, and is shown in Fig. 4, and in plan in Fig. 5. Again two hardened and ground pins *A B* were made, the difference of their diameters being three times the difference in the diameters of the inscribed base circles of the work. These were mounted on the plate with a distance between centers equal to three times that given on the drawing. Two hardened and ground straightedges *C D* were mounted on the plate tangent to both of these pins, thus again originating the required angle. The sizes chosen were such that the diameter of the smaller pin was less than the thickness of the small end of the wedge pieces, thus giving a free space between the pins for inserting the wedge piece *E*. The dimension 1.16525 inches was furnished by the draftsman as the stopping place for the point of the tooth and the gage block *F* was inserted with bushings were made, the radius of the holes being a half thousandth more than the radius of the tooth points. The bushings were sawn down the middle for about half their length, one side of the cut being then removed as shown in the illustration, leaving a lip which would fit over the end of any tooth. A pin was then pressed into the solid part of the bushing, over which to measure with vernier calipers. When these fixtures were clamped over the extreme end teeth after the assembling was complete, the measurement was found to be 0.0001 inch more than the calculated figure, and this I take it is sufficient testimony to the accuracy of the entire work.

Adjusting Ruling Pen and Spacing Lines

By S. M. Ransome

To insure that all the lines of drawing or tracing shall be of the required thickness, so that circles and straight lines shall exhibit the desired uniform appearance, a simple and effective method is to file a small notch in the adjusting screws of all the ruling and compass pens. This is shown in Fig. 1.

The notch should be located so that when it is, say, pointing to the end of the instrument, as shown, the nibs will be set to draw a hair line. All instruments should be marked similarly, then by turning the notch 90 degrees back from this point, a fairly heavy line will be produced, while a half revolution of the screw will give a very heavy line. This method is much quicker and more certain than the usual cut and try.

To draw a large number of parallel horizontal lines equally spaced, without the trouble of measuring off distances for each line or sheet, cut a piece of stiff paper to the shape shown in Fig. 2 and secure to the blade of the T-square by tacks or paste. Then, by setting the edge of the paper guide to coincide with one of the lines already drawn, the next line may be drawn. Next, the T-square is moved down until the guide coincides with the next lower line, in turn; the process itself being much more simple and rapid than the description thereof.

Fig. 1

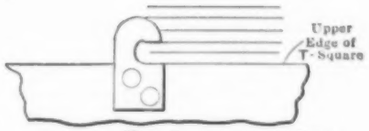


Fig. 2

Two "Kinks" for Draftsmen

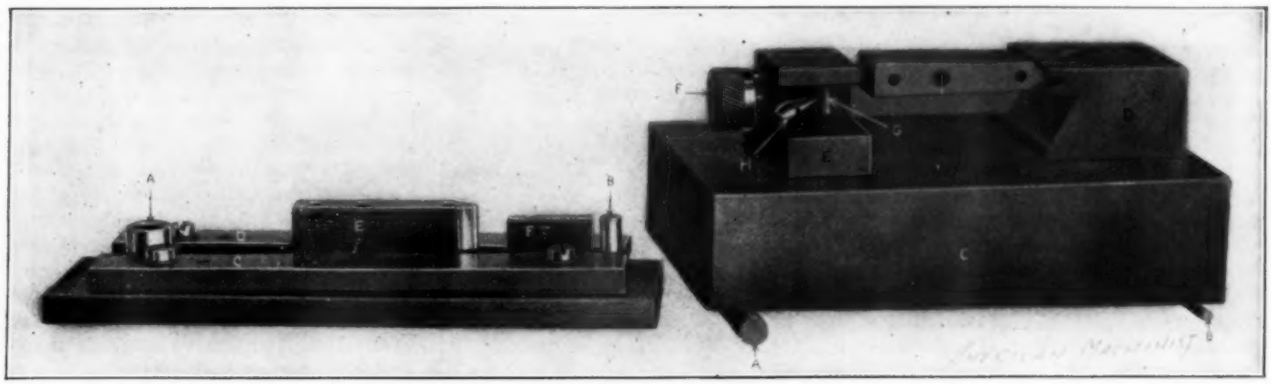


Fig. 4. The Lapping Gage

Fig. 3. The Grinding Fixture

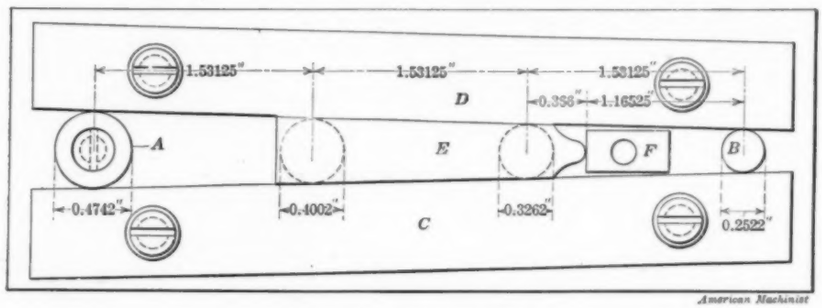


Fig. 5. The Lapping Gage

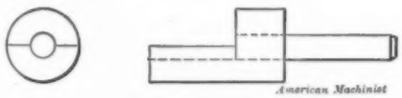


Fig. 6. Tooth-gaging Fixture

its end at this point. The grinding on the fixture shown in Fig. 3 was such as to leave the blocks a little large and thus provide for the final lapping and testing.

When the pieces were assembled they went together with a nice press fit.

Gaging the Pitch of the Teeth

I must mention another testing fixture shown in Fig. 6 and intended to gage the distance between the teeth in the finished die, the points of which are circular arcs. To make this measurement, two small

Germany is exporting approximately 400 locomotives per year. In 1907, for example, Germany exported 395 locomotives. This number was absorbed by Belgium, France, Italy, Russia-in-Europe, Turkey-in-Asia, Southwest Africa, Prussia, Egypt, India, East Indies, Argentina and Chile. For 1907, France took 555,500 pounds; Italy, 504,460 pounds; Egypt, 594,600 pounds; Chile, 449,460 pounds, and Argentina, 446,160 pounds. Egypt took more than any other country, followed in order by France, Italy, Chile, Argentina and Russia-in-Europe.

The Chinese Machinery Trade

By Durand C. Alexander, Jr.

A careful analysis of markets and business methods in China, with special reference to the machinery trade, and helpful hints to American manufacturers who intend to introduce their goods there.

I have become convinced after repeated visits to the machine shops of China in the past six years that the American manufacturer must first understand, in a general way, the markets and business methods of China before he attempts to consider a special branch of trade in that country. Therefore, much that I shall have to say in the present article will apply to trade in all classes of goods in China, though the article is written primarily for American manufacturers of tools.

"Why," says the American manufacturer, looking at the last bulletin of "Exports of Domestic Merchandise From the United States*," "Why did China buy from us, between June, 1909, and June, 1910, only $6340 worth of metal-working machinery, when Germany, having a population only one-eighth of China's, bought nearly $2,000,000 worth in the same period?"

"In Germany," he adds, "We have a protective tariff against us, while in China the imports from all countries pay an equal and merely nominal duty. Why is it then that less than 7 per cent. of all the machinery imported into China in 1909 (the figures for 1910 are not yet published) was shipped from the United States?"

The obvious answer to the first question is, that China is still a very limited market for machinery; but the unpleasant fact still remains that, of the $3,550,000 worth of machinery of all kinds which she did import in 1909, only $230,000 worth—6½ per cent.—was shipped from this country. The answer to the second question is simple. Although duties have been, and are, equal on the goods of all nations imported into China, American manufacturers have never, up to the present time, been allowed to compete on an equal footing with British, French, German or Belgian toolmakers for the principal part of the trade. The explanation of this lies in the fact that 90 per cent. of all the tools (machine- and otherwise) which have been bought for, and imported into, China, have not been bought by the Chinese themselves, but by Europeans.

In some cases such tools have been bought to equip shops actually owned and operated by Europeans; for example, the Hong Kong & Whampoa Dock Company, the Shanghai Dock & Engineering Company, and the Tangshan Mining & Engineering Company. It is quite natural that the British owners of these shops have equipped them almost exclusively with British tools. Such shops, however, contain but a small portion of the tools which have been imported into China.

*Issued by the Bureau of Statistics of the Department of Commerce and Labor.

The greater number are contained in railway shops and arsenals built by Europeans for the Chinese Government, with funds loaned by one or more European firms. Examples of such enterprises are:

The Imperial Railways of North China, built with funds provided by the Hong Kong & Shanghai Banking Corporation (British).

The Chinese Eastern Railway; loan

CHINESE SAWING BOARDS WITH A WHIP SAW

provided by the Russo-Chinese Bank (Russian).

The Peking-Hankow Railway, loan made by a Belgian company, but stock subscribed principally in France.

The Tientsin-Nanking Railway, funds provided jointly by the Deutsche-Asiatische Bank (German) and Jardine, Matheson (British).

An important condition of these loans has formerly been that the engineer-in-chief and auditor of each railway should be Europeans, appointed by the firm making the loan; and that all materials, equipment and tools should be selected by the chief engineer, and purchased by the agents selected by the financing firm. Moreover, the purchasing agents have usually been authorized to charge 5 per cent. buying commission on all such purchases. In this connection, and as an indication of the amount of materials and tools imported for various Chinese railways, it is interesting to note that the commissions of the British purchasing agents for the Shanghai-Nanking Railway (a line 203 miles long) amounted to nearly $300,000; while, for similar services in connection with the Canton-Kowloon Railway (90 miles in length) a commission of about $170,000 is to be paid. Needless to say, the purchasing agents have invariably placed all their orders with manufacturers of their own nationality.

China to Make Her Own Purchases

But recently a new era has dawned, an era in which there are and will be, excellent opportunities for the formerly "frozen out" American manufacturer of railway supplies and machine tools. China has now definitely adopted the policy of building her own railways, under the supervision of her own engineers; and, while funds may still be obtained abroad, their expenditure will be in the hands of Chinese directors who will buy in the most favorable markets. A substantial answer to the frequently heard argument that China has no competent engineers of her own, is the newly opened Peking-Kalgan Railway, a line which has been built—and thoroughly well built—at a very moderate cost, in the face of great engineering difficulties, by Taotai Jeme Tien Yow, a graduate of the Yale college of engineering, and his Chinese assistants. While this is the best example of native Chinese railway engineering, several other shorter lines have been similarly built, and a large number are either under construction or contemplated. And not only are the Chinese beginning to build their own railways, but they are now constructing and operating, without European assistance or advice, arsenals and machine shops also. Examples of these are: The new arsenal at Chengtufu and the shops of the Yangsze Engineering and Shipbuilding Company at Hankow, the latter a growing concern which competes successfully with the European managed shops on the Yangsze river. Here then lies the opportunity for the energetic American toolmaker who will seriously study, and patiently seek the Chinese market.

Suggestions for Introducing American Tools

Recognizing the opportunity, many manufacturers will be in doubt as to the best method of improving it; it is for them that the following suggestions are offered—suggestions based upon my own visits to China, and experience gained in introducing American tools into that market.

A general knowledge of the kinds and quantities of any given article which is now being imported into China may be gained by a study of the reports of the Imperial Maritime Customs of China, which are still under European control. These figures will serve to indicate how large is the *existing* market for any commodity; but the far-seeing manufacturer will not always be discouraged by meager figures in his line, but will ask himself if it is not possible to *make* a market in China for the kind of goods that he produces.

Without doubt, the wisest course—and the one which will in the end prove the best investment—is for the manufacturer to send a competent representative to investigate personally the markets of China. The reports made, and the connections established, by such a man will usually prove rock-ribbed foundations for a sound and growing business, among the shifting sands of haphazard business connections made in ignorance and conducted without method or definite aim. Should such a representative be sent, his first discovery will be that some classes of goods (for example, motor cars and large machinery) are at present handled only by European houses; while others are handled only by Chinese merchants; and still other classes are stocked by both European and Chinese firms. A second discovery will be that many markets in China—even those not widely separated—are greatly dissimilar. A given article may have a large sale in Hong Kong, the entrepôt of South China, and no sale at all in Shanghai and Tientsin, which supply North China. Or he may find, as is often the case, that the goods of one certain manufacturer are sold exclusively by Hankow merchants, while in Canton, a similar article must bear the label of another certain manufacturer in order to sell at all. He will also quickly recognize the fact that in China there are three distinct classes of trade, each of which must be sought in a different manner.

The first class consist in sales made direct to the large consumers, such as dock yards and railway shops. The manufacturer's representative must personally call upon the heads of these institutions and endeavor to introduce his goods by securing trial orders. If he is successful in this, he not only has the ice broken as regards that particular establishment, but he will also find that, as a result, it is much easier to induce merchants (both European and native) to stock his goods, since they are then reasonably sure of at least one customer for them.

These trial orders from dock yards and railway shops are usually sent through the London agents of the concern, and these agents make the necessary arrangements for the shipping of the goods, and also undertake to meet, in London, the manufacturer's draft. Since the traveler cannot, of course, remain always "on the ground" he must, before leaving a city, effect an arrangement with some local firm to "follow up" these large consumers. But he should stipulate clearly that this arrangement shall not debar him from making other arrangements for securing business from the Chinese merchants.

The second class of trade is the valuable market among the foreign residents in such places as Shanghai, Hong Kong, Tientsin, Hankow and Canton, where certain sections of the city are held and administered by European municipalities, and where large European stores carry heavy stocks of goods, including hardware and tools. This European trade is usually entirely separate and distinct from the Chinese trade, and it is here that the manufacturer may expect to sell the higher grade of his goods—if he has more than one grade. If, however, he manufacturers but one class and quality of goods, and expects to sell these goods to both European and Chinese merchants, he will usually have to give (and sometimes agree *always* to give) somewhat lower prices to the European merchants than to the Chinese, since it is recognized that Europeans cannot do business upon the small margin of profit which satisfies the Chinese.

By the time that the manufacturer's representative has called upon the large consumers, and also upon the European stores in, let us say, Shanghai, he will have accumulated from such calls (and from equally valuable intercourse with business men in the club) not only a fair amount of orders for his goods, but also a general stock of information regarding the firms and business methods of the place.

Method of Effecting Sales

He has now to face the more serious and difficult task of introducing his goods among the Chinese merchants, and of arranging safe channels through which this class of trade may come. Needless to say, the above mentioned "channels" are the European commission houses which execute the orders of the Chinese dealers for a small buying commission, and undertake to pay the manufacturer's draft—to which the shipping documents are usually attached to be delivered upon payment.

At this stage a wrong judgment or mistaken policy may work an injury that will require years to repair, and the wise traveler does well to make haste slowly at this time. The particular knowledge he first needs can best be obtained by personal visits to the shops of the Chinese merchants who handle his line of goods, and he can always find an English-speaking Chinese "shroff" (clerk) who will accompany him, for a small compensation, to act as guide or, in the infrequent cases where the merchant does not speak and understand "pidgin" English, as interpreter.

The Chinese merchant is usually interested in new goods (though there are exceptions to this rule) and, if tactfully questioned, will give all the information desired and will often allow the visitor to inspect his stock and even see the invoices of other manufacturers. However, such results are not obtained on the first visit and any display of haste, impatience or irritation will figuratively close the door in the visitor's face.

After a few days spent in the leisurely visits, the manufacturer's representative will have informed himself upon the following points at least: (1) Whose goods of that particular line are being principally imported and at what prices they are bought and sold; (2) Through what commission houses these goods are principally imported, and which, if any has has a sole agency for their importation; (3) With which commission houses the Chinese merchants prefer to deal, and why; (4) The reason for the popularity of the particular make of goods which hold the market; (5) The opinions of the leading dealers as to the best methods of introducing the new line.

Armed with this information, the traveler usually finds his field of choice limited to two or three commission houses; and he may then elect to work with several, or to place the sole agency for his goods with one house. There are arguments in favor of both plans, but good results are often obtained by working with several houses upon equal terms until one demonstrates its superiority as a business getter over the others. Having selected a commission house, or houses, through which to work, the traveler must consult with them upon the prices and terms to be quoted to the Chinese dealers; and in this he will be enormously aided if he has secured, as suggested above, first-hand information regarding the prices and methods of competing manufacturers.

For some classes of goods the Chinese merchant prefers a "home-side" price, that is, a net price for goods delivered f.o.b. steamer at, say, New York, to which price, he understands, the commission houses will add freight, insurance, buying commission, and also interest and collection charges upon the relative draft. In other cases the merchant may prefer "c.i.f." terms, which means a price including freight and insurance to his port; and, in many instances, he will insist upon a price "c.i.f.c. and i.," which includes buying commission and interest upon the draft as well as freight and insurance. Merchants in interior cities often desire a price "free on rails" at the nearest port, which price, of course, includes c.i.f.c. and i. and also duty, landing charges and cartage to the railway. The safest policy for the manufacturer's

agent is to quote to the commission house a net price f.o.b., say, at New York, leaving the commission house to estimate for themselves the various charges, and to quote on their own account and risk, such terms as the dealer demands. In many instances the Chinese display wonderful shrewdness by demanding prices upon all of the terms described above; and then pouncing with surprising accuracy upon the set of terms which are slightly more favorable than the others.

To secure an initial order from a Chinese merchant, it is absolutely essential that he sees an exact sample of the article he is asked to buy; catalogs and photographs are useless until he has become satisfied by long experience of the reliability of the manufacturer's goods. This prejudice is so strong that I have known a merchant to decline to order a 9-inch size of a certain tool because the nearest thing the traveler could show him were the 8- and 10-inch sizes. Therefore, it is good policy for manufacturers to supply their travelers with generous lines of samples, so arranged that they may be freely handled.

On the first visit to a city it is very difficult to secure orders from the Chinese, even when the quality, prices and terms offered are distinctly advantageous. For one thing, the Chinese are extremely conservative; for another, each dealer wishes to be the last one in his city to place an order, fearing that someone, ordering after him, might secure better prices and terms. But if the traveler will patiently endure repeated disappointments, broken engagements and broken promises, he will almost invariably secure trial orders which will lead to a substantial, growing business, providing that his goods and prices are right.

Mistakes of American Manufacturers

I think most of our manufacturers make two cardinal mistakes; one, that they become discouraged at the small initial business; and the other, that they wish to assess the entire expense of the traveler's first trip against the business he secures on that trip, not realizing that, for many years to come, that trip will yield a steadily increasing harvest of business. The experience of going into an open market and meeting the competition of all nationalities upon an equal footing is, in itself, a valuable education; and I believe that the manufacturers who have stepped boldly from behind their protective-tariff breastwork and successfully stood their ground in the open field will admit, that, for domestic, as well as for export trade, their goods, their factories, and their business methods have been vastly improved as a result.

If patience be the highest virtue in dealing with the Chinese, forbearance is a close second. The man who knows when to "turn down" business, and will do so firmly, is a Solomon among export travelers. Despite the usual conservatism of Chinese merchants, opportunities do occur when over-selling would be easy. Many a merchant will offer to double or treble his order for a concession of one or two per cent. But woe to the traveler who yields to this temptation, or who accepts orders for more stock than he knows the merchant can sell within a twelve-month. His next visit to that city will be a bitter one. If he has given one merchant a better price than the others, the fact will be common property, and the unfavored ones will not be appeased; while, if he has allowed one or two to overstock, the result will be that they have sold at cost to clear their stock, and from every dealer the complaint will be heard, "My cargo no walkee; no can catch any chance" (My stock will not sell, I cannot make any profit), and fresh orders will be scarce as strawberries on a cactus-bush. However, it must be said in this connection that it is usual, and often good policy, to give a slightly better price for large orders than for small, providing that all the merchants know that this will be done. The petty dealer may refuse to order if he cannot get the same price as the wholesaler; but he will later buy from the wholesaler, who thereupon increases his orders to the factory.

Chinese Street Blacksmith Shop

Value of Trade Marks

Now I have come to a topic of so much importance in Chinese trade that it almost deserves an essay in itself. That topic is "Chop" or trade-mark. From the moment that one lands in the Orient—be it China, India or Japan—to the moment that he sails away, "Chop" is dinned into his ears at every turn. In China an established chop is worth a king's ransom. Ninety-nine per cent. of the small tools, hardware, and metal wares are sold, not upon quality or price, but upon chop, and when a manufacturer has succeeded in establishing his trade-mark in Oriental markets, he may, upon this asset alone, increase his capital stock materially without being justly charged with "watering." Every traveler who has ever undertaken to introduce a new manufacture into China has been driven to the verge of madness by the calm reply to all his inducements and arguments, "Any man he wantchee Eagle Chop"—or some other specific brand. To establish firmly a new chop requires years of patient work, since it is not only the dealer who has to be convinced, but the ultimate petty consumer in far-off corners of China, who, through his ignorance and stubborn adherence to the established order of things, often contemptuously refuses to try an article bearing an unknown brand, even when appearance and price are all in its favor. But even in China, merit eventually wins, and the time does come when the steadfast interloper becomes the tenant, and finds himself intrenched behind, instead of beating against, the stone wall of chop.

The field of designs for trade-marks has been hard worked by European manufacturers, and nearly everything, from a hand or an eye, to a light-house or a locomotive, is in use, or has been tried. By business courtesy manufacturers avoid the use of one another's trade-marks in China, although at the present time there is no real copyright law in that country as between different nationalities. Should a manufacturer infringe the trade-mark of one of his own nationals, an action, of course, lies in the consular court of that nation. But the movement for a Chinese copyright law is strong, and manufactur-

ers are advised to file applications for copyrights with their consuls in China; the understanding being that, when a Chinese copyright law is adopted, all consuls will submit their lists of applications to be entered *en bloc*, and copyrights will be granted in the order of priority of application.

For years to come the market in China for large and expensive tools will not be large, though still worth seeking. Automatic machines and labor-saving devices cannot be popular in a country where labor is the cheapest of commodities, and where only the Government can find sufficient capital for large enterprises. But the Chinese are by nature skilful artisans, and take great pride in the tools (crude though they often are) with which they produce surprising results.

Chinese Skilful Workmen

I recall an incident which occurred in Antung during a recent visit to that port. The gentleman with whom I was staying, being in need of some tables and chairs, called in a Chinese carpenter and showed him an illustrated catalog of "mission" furniture. In answer to the question, if he could make such articles, the workman laconically replied "Can do" and took the catalog away with him. At sunrise the next morning he and an assistant returned bringing a whole log of hardwood, some chisels, hammers and very rough looking saws. The carpenter displayed some models of tables and chairs which he had made from the pictures and, on being assured that his ideas were correct, set to work. The huge log was propped up with one end resting on the ground, and then the workmen whip-sawed planks out of it, one standing on the log, and the other on the ground as shown in the illustration, Fig. 1. This work occupied an entire day; a second day was spent in planing the planks by hand and two or three more were consumed in fashioning and joining the furniture. But by the end of the week the tables and chairs were done and were really remarkable for their neatness and strength. The combined cost of the material and labor was less than one-third of what one would have to pay for equally serviceable furniture in this country.

The purpose of my visit to Antung was to ascertain the possibilities of the place as a market for saws and saw-files. A large part of the lumber used throughout China comes from the upper waters of the Yalu river at the mouth of which Antung stands. I naturally expected to find a number of sawmills at that place. At Wiju on the Korean side of the river I did find several steam sawmills under Japanese management, but on the Chinese side the logs were still being whip-sawed by hand exactly as I have described.

Then I discovered why Antung was not a market for foreign-made saws and files. The Chinese were making these tools as they needed them! All along the streets of the city small portable forges were erected, at each of which one or two blacksmiths were at work, see Fig. 2. With rough, but strong, hand-shears they were cutting saw-teeth in strips of mild steel and then fitting handles to the saw. The saws were usually made to order under the critical eye of the purchaser, but the files (which were of an odd shape) were standing in bright rows, ready forged, with the teeth excellently cut by hand. To demonstrate to the filemakers the assumed superiority in hardness of imported files, I ran a bit of hard-steel over the face of an American file, showing how perfectly the file would cut it. Then I picked up one of the homemade files from the forge to test in the same way. But, before allowing me to do so, the blacksmith took the file from my hand, heated it in his forge and plunged it into cold water, the result being a file which cut practically as well as the American article. The price of the finished Chinese file was about 15 cents (United States currency)—somewhat less than the price for which an imported file of approximately the same shape could be sold.

The above incidents are given as illustrations of the cheapness and skill of Chinese labor; but it must not be assumed that in all parts of China labor is as cheap as in Antung, or as content with homemade tools. A large quantity of hand tools is now being imported and the market is growing. British tools predominate because of their long established "chops" and excellent quality, but the sale of the cheaper German tools is on the increase. These, however, are usually much inferior to the British in quality and many Chinese merchants and importing houses have told me that they consider American tools the "happy medium," being about equal in quality to the British and not much higher in price than the German.

Success of the Germans in China

The increasing success of German machinery, tools and metal wares in China has been principally due to the unrelenting efforts of several large German houses which have branches in all the principal trade centers of China and in Berlin, London and New York as well. These houses have their technical departments and engineering staffs which can supply, without delay, full specifications and prices for manufacturing plants of all kinds, such as arsenals, railway shops, lighting and power plants, cement, paper and flour mills, etc. Because of their energy, size and presence "on the ground" these houses have been very successful in introducing German tools. A number of American manufacturers have also selected them as agents, often with satisfactory results. However, it is obvious that American goods would have a better chance of success if they were handled by American houses as widely represented and as well equipped as are the large German and English houses in China; it is to be hoped that, through the expansion of existing firms, or the establishment of new ones, American interests may soon be so represented. This must not be taken to imply that English and German houses do not give their attention to the American goods which they handle. I have had business dealings with many British houses in China and other parts of the Orient and have almost invariably found them capable, upright and fair in the highest degree. It is only natural that they should be better acquainted with British, than American manufacturers; and that, when similar goods can be obtained in both countries at nearly equal prices, they should give the preference to their own nationals.

Manner of Advertising

The question is often raised, "What is the best method of advertising in China?" That problem is a perplexing one and I do not pretend to have solved it. But I am satisfied that the Chinese newspapers and publications are of little value as advertising mediums because of their limited circulation and the fact that the proportion of probable buyers to the number of readers is very small. The American and British technical magazines are read by many engineers, both European and Chinese, and American toolmakers would benefit greatly if the circulation in China of our trade papers could be extended. Inducements of any kind which will cause the merchants to press a particular article upon their customers are the most efficacious "advertisements," but it is seldom that a dealer can be made to depart from the Chinese custom of asking the buyer what chop, as well as what article he wants and giving him what he asks for without comment or suggestion.

It has often occurred to me that American manufacturers—especially manufacturers of tools and machinery—are overlooking an excellent means of making their goods better known in China. Hundreds of the future engineers and business directors of Chinese enterprises are at present students in American schools and universities. If the manufacturer would take the trouble to ascertain the names of Chinese students in near-by colleges, invite them to visit his factory and entertain them properly, he would be spreading a wide net for future business. The same course might well be followed with native and European engineers residing in China, who visit America. I have heard many of these men say, "I should like to visit America and see your great factories and shops, but I know no one there and probably could not get permission to see the factories in

which I am interested." What better form of advertisement could there be than for manufacturers to get into communication with the officials of the railway shops, machine shops, and dock yards of China and extend to them a cordial invitation to visit our shops? The money spent in entertaining these men would be returned ten-fold in new business from China.

Further as regards advertising in China it may be said that the Chinese usually do not value what they get for nothing, so advertising novelties should be distributed by exchange rather than gratuitously. I recall an instance of the success of this method. One day in Shanghai I saw the office of an American tobacco firm being almost mobbed by a huge crowd of Chinese, each man flourishing a red cardboard box over his head and struggling toward an open window. Upon inquiry, I learned that the tobacco company had advertised to exchange a Chinese calendar for each empty box which had contained a dozen packages of their cigarettes, and that the scheme had been most successful in increasing the sale of their goods. I have always hoped that the supply of calendars proved adequate for the Chinese are slow to forget an unfilled promise.

At about the same time one of the principal foreign banking houses in Shanghai had an unfortunate experience with their issue of Chinese calendars. The calendar, which is very elaborate and complex, has to be lithographed. In order to be forehanded the bank had it printed two months before Chinese New Year (which usually falls in February). Then the Emperor of China died suddenly, and their calendar became worthless, since in China as in Japan the name of the year changes with each emperor.

A smart German manufacturer of analine dyes put a Chinese ten-cent piece into each package of dyes in his first shipments to China. The workmen in the dye-houses unanimously informed their employers that the new dyes were the most wonderful and economical they had ever used. As a result local stocks of the new dye were too small to meet the demand. What the workmen said later, when they no longer found the ten-cent pieces, is not recorded.

In conclusion, I would especially urge upon our manufacturers who are engaging, or intend to engage, in business with China and other Oriental countries, that they establish an export department in their business organization, and require the managers of that department to make a special study of those markets and the proper methods of export business. The over-worked domestic sales manager has no time for such study and the handling of export business in the same manner as domestic business invariably leads to mistakes and loss of business. The manager of one of the principal engineering houses in the East, a wide-awake, progressive firm which handles large quantities of American as well as British, machinery and tools, once said to me, "I know of only three American manufacturers who really understand export business, our dealings with the others are a sort of gamble." Then he recited a series of mistakes and errors which would fill several pages—all of them, things which would have been avoided by an elementary knowledge of export methods and customs.

Many manufacturers, to avoid the trouble and expense of maintaining an export department, entrust their Oriental business entirely to New York and London export houses. These houses are an excellent medium for the sale of many kinds of goods abroad, but it seems to me very doubtful policy for manufacturers—especially manufacturers of expensive and complicated tools—to forego the knowledge of the ultimate destination of their goods and of the price which the consumer is required to pay for them. I think I am safe in saying that nine out of every ten American manufacturers who are today really successful in the Chinese, or other Oriental, markets are manufacturers who know the final destination of all the goods they sell and keep in touch with the Oriental consumer and dealer. To do so and still maintain cordial relations with exporters requires the exercise only of tact and common business honesty.

Fixtures for Turning Six Throw Crank Shafts

By M. E. Hoag

The crank-shaft turning fixtures shown in the halftone are in use at the shops of Wood Brothers, of Des Moines, Iowa; builders of thrashing machines and traction engines.

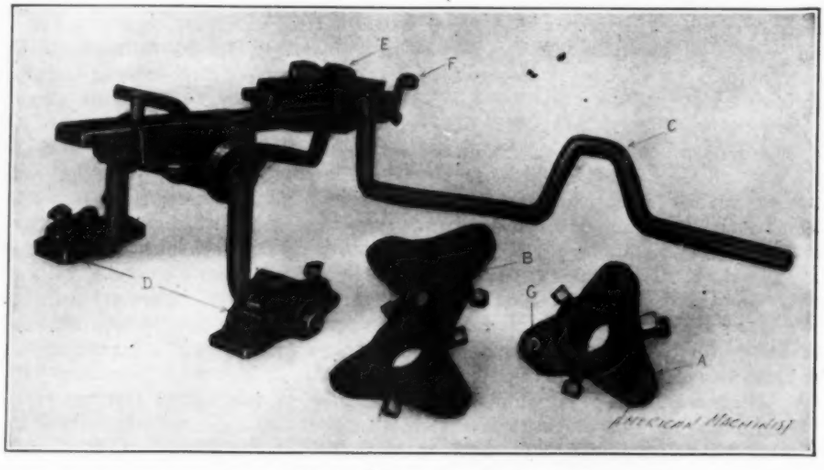
The shaft shown at *C* is 6-throw, 120-degree angles, bent from round stock, and is used to operate parts of a thrashing-machine separator.

As the exact length of throw is of no particular importance the only thing to look for is a good bearing surface. In turning these bearings the shaft is dogged and put on the lathe centers, then the fixture, which is attached to the lathe carriage by bolts in the bearings *D*, is slipped on one of the rough throws and held against the spring tool *E* by a clamp, and a hardened bearing which is operated by the screw *F*. As the tool removes stock the screw *F* is fed in until the proper bearing is obtained. The whole tool-carrying frame moves around with the crank being turned. The carriage is then advanced to the next throw, and so on.

In turning a larger cast-steel shaft where the length of throw is important, the fixtures shown at *A* and *B* are used. The shaft is first centered and the end bearings turned up to fit the holes in fixtures, which one then slipped on and held by set screws. The work and fixtures are then placed on the lathe centers, each fixture being fitted with a hardened-steel center shown at *G*. Hardened-steel pins fitting the other small holes in the fixtures serve to index the work. After placing on centers, the work is lined up, any necessary adjustments being made by loosening the set screws and slipping the work around in the fixtures.

After lining up the first throw is turned, then the set screws in the halves of the fixtures that contain the hardened-steel centers are loosened and the work turned 120 degrees and located by the hardened pins in the index holes. In this way all 6 throws are turned in a very short time, and with a very small cost for fixtures.

The practice of casting chucking pieces on work does not seem to be as common as it deserves. A few ounces of metal cast in the right place often allows a piece to be finished all over at one operation instead of two. This not only saves time but insures both ends being in line with each other. It often pays to thread the chucking piece with a die in a turret and use a tapped chuck for holding it.



Tools Used to Turn Crank Shafts

The Chemical Coloring of Metals*—II

By F. Reinboth

Details of a number of important recipes and processes in coloring copper, copper alloys, iron, steel, tin, zinc, aluminum, silver and gold. The use of commercial baths and preservation of the colors when obtained.

*Translated from the German.

Coloring of Copper

It is possible to produce on copper a series of colors (annealing colors), merely by heating on the sand bath, or in air. The color tone is then dependent upon the temperature and duration of the heating. There arise thus a series of color tones, orange, rose-red, violet, steel-white, brass-yellow, flesh tint and green. Coloring by annealing requires, however, great judgment. The object must be completely free from grease, dirt and oxide. Every touch with the fingers, every particle of dust, produces a spot. The temperature of all parts must be equal. It must be borne in mind that the object, when removed from the air bath, will, because of the heat remaining in it, continue to oxidize and darken. The piece must, therefore, be cooled in water shortly before attaining the desired tints. With insufficient experience and skill, this art of coloring is extremely uncertain. The unpracticed hand can get far better results with any other process.

Thus there may easily be produced a red-brown color consisting of copper protoxide if five parts of hematite, that is, natural ferric oxide, and eight parts graphite are stirred to a thick broth with alcohol, applied to the object, allowed to act on it for about twenty-four hours, and then rubbed with a medium-hard brush until the surface is smooth and shining. Variation of the proportion of hematite and graphite will, at pleasure, call forth brighter and darker tones.

For copper vessels there is often used a mixture of one part pulverized horn shavings, four parts of the red oxide of iron (hematite) and four parts of verdigris mixed to a broth with vinegar. Objects daubed with this mixture are dried over an open fire until the coating has become black. Then the metal is washed and dried. The tone thus produced is in Germany called "English brown." Medals may be given a beautiful brown color with the following solution: Boil together 35 grams* of verdigris, and 17.5 grams of sal-ammoniac in 7 liters* of water until it has boiled down to 1½ liters, then add 1½ liters of vinegar, filter, and finally dilute the resulting liquid to 5 or 6 liters. The medals are laid in this boiling fluid. They may be colored still darker by heating on an iron plate. Verdigris and sal-ammoniac must be put in the boiling water at the same time so that no separation of copper oxide takes place.

Brown Oxide

The so called brown oxide is attained by treatment with a warm solution of 25 or 30 grams ammonia sulphide in one liter of water. The coloring then consists of copper sulphide. After drying, the object is brushed with a waxed brush, or with hematite powder. For bronzing ornamental objects, there is a special process: Dip first, keeping them in constant motion, in a boiling solution of 2 grams platinic chloride to one liter of water. As soon as a perceptible color has formed, put them in a second solution of 5 grams platinic chloride to 1 liter of water, heated to 122 degrees Fahrenheit, likewise with continuous agitation, until the desired tone is reached. Thus may be produced tints from bronze color to gray and steel color.

Copper is corroded black by dipping in a "blackening acid," which consists of 600 grams copper nitrate in 300 grams water, to which are added one to two grams of silver nitrate. After the dipping, the article is heated. For the same purpose will answer a solution of 10 grams cupric carbonate, 70 grams spirits of ammonia and 150 grams water. The water is not applied until the carbonate has dissolved in the strong spirits of ammonia. Copper is colored blue-black by dipping in a solution of 20 grams liver of sulphur (hepar) and 20 grams ammonium carbonate in one liter of water. By scraping is produced a very warm, reddish-brown tone. If, in salient spots, the patina be polished away, so that the copper tone appears, the result is called smoked copper.

A steel-gray color is made by dipping in a moderately warm solution of trichloride of antimony in hydrochloric acid, constituting of the commercial *stibii chlorati*. Luster colors, consisting of a series through orange, terra-cotta, blood red and rainbow colors, are produced by dipping the copper article in a mixture at about 176 degrees Fahrenheit, containing equal volumes of a solution of 130 grams sodium hyposulphite in one liter water and a solution of 25 grams copper sulphate, 10 grams crystalline verdigris and one-half gram sodium arsenate, likewise in one liter of water.

Artificial Patina

Where there are copper objects, such as images, it is often necessary to give them that antique appearance which arouses interest on old statues and bronze castings. This is commonly displayed as a dark brownish-black to dark greenish-black ground with bluish-green to bright-green patina. As respects the artificial production of this patina it is the better looking and the more similar to the true patina, the more slowly it is produced and the more closely the process of formation approximates to that of the natural patina. The most suitable method is, therefore, as follows: The objects are placed in a room as warm as possible and there repeatedly moistened with greatly diluted vinegar, preferably by means of a fine spray. Thus is formed an ill-looking coat of basic cupric acetate, which subsequently must be converted into the basic cupric carbonate forming the patina. For this purpose we let drop into a vessel containing carbonate of soda some hydrochloric acid (diluted 1 to 2), thus developing carbonic acid, which quite quickly completes the change of the acetate into the carbonate. During the development of the carbonic acid, the object must constantly be kept wet with pure water. The patina thus obtained is very similar to the natural, but in contrast thereto extends over the entire surface. By rubbing with soft woolen cloths or by treatment with brushes in suitable places, it can be given a very natural appearance.

Coloring of Copper Alloys

The coloring of copper alloys, especially brass, tombac and bronze, can, to start with, be performed in the same way as on copper, provided the alloys first be given a copper coating. As respects brass in particular, it can, analogously to copper, be given a series of beautiful annealing colors by heating. A golden yellow, orange-red to carmine-red tint, is produced on polished brass by dipping in a mixture of 5 grams caustic soda, 50 grams water and 10 grams cupric carbonate. The colors appear in a short time. Alloys with about 50 per cent. copper become in a minute golden yellow, in two minutes reddish yellow, in three to ten minutes brown to red, in ten minutes violet blue, in twelve to seventeen minutes blue. An alloy of about 85 per cent. copper becomes first golden brown, then brown, finally dark blue. Yellow to brown colorings are produced in a bath of 20 grams arsenious acid and 20 grams carbonate of potash, dissolved in 20 grams hot water, where-

*1 gram = 15.4 grains.
†1 liter = 1.06 quarts.

after two liters water and 500 grams yellow ammonium sulphide are also added.

A beautiful brown patina, known as *Bronce Barbédienne* is obtained by dipping in a warm bath freshly filled with arsenious sulphide (*Arsensülfur*) in spirits of ammonia, which is mixed with enough ammonium sulphide to produce a slight turbidity. The colored articles must afterward be thoroughly scraped. Black color is made in a manner analogous to that on copper. Likewise the steel-gray tint. This last can also be called forth by immersion in a bath of two kilograms* of crude hydrochloric acid, 400 grams iron hammer scale, 100 grams arsenious acid, 500 grams of the liquor *stibii chlorati* above defined. After dissolving warm, it is allowed to settle, the clear liquid is drawn off, and enough crude hydrochloric acid is added to bring this to the weight of 2 kilograms.

Violet Color on Brass

A superbly beautiful violet color, especially suitable for physical laboratory intruments, etc., may be made on brass by spotting the object, brought to a temperature as warm, say, as that of the hand, with cloth pads or feather brushes of suitable sort. A green patina is produced by the same means as upon copper. The composition of the alloy here has a good deal to do with the aspect of the tints. Bright colors, so called luster colors, are made in the following manner: Two solutions, one containing 130 grams sodium hyposulphite in one liter water, the other 35 grams sugar of lead in one liter water, are mixed and heated to 176 degrees Fahrenheit. In this mixture the object is moved back and forth. There arises first a golden-yellow color which gradually changes into violet, blue and green.

With these kinks and recipes, the variety of processes is, however, far from being exhausted. Those given above are the most usual and will generally suffice for everyday needs. We may now turn to the other metals, such as iron, zinc and aluminum. First I may say something about the copper-tin alloys, the bronzes, for which in general the same is true as for copper-zinc alloys. They behave somewhat differently, however, with a cupric chloride solution, which does not turn them black but only gives them a reddish tint.

Whoever goes through the world with open eyes must notice that our modern bronze statues seldom have the prized patina of the old ones. This is simply due to the fact that, in consequence of the growth of towns and industries, the air contains not only those constituents which call forth the natural patina, but many others, such as gases of combustion and sulphurous acid which act upon the bronze in other ways, bringing out no longer the beautiful green patina but rather producing false tones.

*1 kilogram = 2.2 pounds.

Coloring of Iron

As to iron and its coloring processes, it may be said that the best tints are gotten when the iron is previously electroplated with copper in an alkaline copper bath and then this copper coating given the color. Well known are the tempering colors of iron called out by heat, the best of which is blue. Often blue-annealed objects intended for ornamental purposes are covered in part with a laquer and then poured over with vinegar which leaves the covered part unchanged. Often, too, a blue color is produced by chemical means, for which one may use the same bath as for making luster colors on brass. Far most often, however, come into consideration for iron the black coloring process and the so called browning process. For both of them there are many formulas. The following two methods are adapted to blackening of small articles in quantities:

The objects, by one method, are heated in a revolving drum with ten parts sawdust to one part linseed oil over a gas or a coal fire. This makes a thick smoke which colors the iron pieces a deep black. According to the other method, which is likewise notable for cheapness, two baths are prepared. First, 10 grams of copper vitriol are dissolved in water, 15 grams stannous chloride and 20 grams pure hydrochloric acid added and the mixture filled up to one liter. The fluid becomes clouded and throws down white flakes. So soon as it is free from the flakes the articles are immersed for about 10 seconds in this bronze bath, strung on a wire or placed on a metal sieve, while being thoroughly shaken. Then, after a good washing with water, they are at once placed for two or three minutes in a second cold bath consisting of 1.5 kilograms, hyposulphite of soda, and 75 grams hydrochloric acid to 1 liter of water. In preparing it, the sodium salt is first dissolved in water and the solution filtered, if necessary. After addition of the hydrochloric acid, sulphur is precipitated and the fluid must be freed from the coarse lumps of sulphur by filtering. If well corked up, the bronze bath will last a good while; the sulphur bath, however, loses its efficiency after about two hours, but may always be freshened by adding hydrochloric acid.

Large objects can, as in the case of copper, be washed over with an aqueous or alcoholic solution of copper nitrate, which is then burned off over an open fire and thus they are colored black. There may also be recommended a dipping of the iron in balsam of sulphur, that is, flowers of sulphur heated a long time in linseed oil, the objects thereafter being heated. The balsam of sulphur must not then be allowed to burn, since this would cause spots. Therefore, it is advisable to do the heating in a muffle.

Browning of Iron and Steel

The browning of iron and steel, as practised on gun barrels and the like, is accomplished through dissolving two parts crystallized ferric chloride, two parts trichloride of antimony and one part gallic acid (tannic acid) in four parts water and spreading this solution over the objects with a sponge or rag. It is then allowed to dry in and the treatment repeated several times until the color appears dark enough. In the meantime, the object is simply moistened with dilute nitric acid (strength 1 to 10) and allowed to dry in the sun, if possible. The resulting rust is removed with a scratch brush and the treatment repeated till a beautiful regular hard layer of oxide is produced. Most commonly, the browning is done with the so called English browning salt.

For this purpose is used the trichloride of antimony sometimes known commercially as butter of antimony. With four parts is mixed one part olive oil. They are well shaken together. This mixture is applied with a fine hair brush to the iron piece which has been slightly heated. It is allowed to dry in air about three or four days until the desired brown color is reached. Finally, the objects are rubbed off, washed with water and either polished or lacquered.

Coloring of Zinc

Direct coloring of zinc generally in practice consists of blackening; all other tones are produced on wares previously coppered. The so called black pickle is composed of 80 to 100 grams copper vitriol, 40 grams chlorate of potash and 500 grams water. The solution is prepared hot, and after cooling is filtered. It is spread with a soft brush on the object which at first turns only reddish. As soon as the black color appears, it is washed and dried. For articles in quantities the solution may be placed in a drum with sawdust. The coating is rendered durable by heating on an iron plate. The same effect is obtained with a mixture of 90 grams trichloride of antimony, 800 grams alcohol and 60 grams hydrochloric acid. The solution is then rubbed off with a rag and more of it put on. After that, as fast as possible, the object is allowed to dry in a warm place and finally rubbed with linseed oil. For black coloring of sheet zinc, such as is used for roofing purposes, there may be employed a solution of one part cupric chloride to 60 parts water, acidified with hydrochloric acid.

Tin Coloring

Tin may be colored black with a solution of ferric chloride or with a strong hydrochloric or nitric solution of 12 parts

of copper acetate, three of sal-ammoniac and 20 of vinegar in 500 of water.

Aluminum Coloring

In order to color aluminum objects, they are generally coppered and colored by the known methods. Black may be produced directly with a platinic chloride solution. Also, by heating, as in the case of copper, a series of annealing colors may be brought out. Aluminum alloys are colored after the manner of copper.

Silver Coloring

The coloring of silver consists only in the so called "oxidizing," but properly to be termed "sulphuring" process for producing an antique silver appearance. According to this, the wares are put into a solution, heated to 176 degrees Fahrenheit, of 5 grams liver of sulphur and 10 grams of carbonate of ammonia, in 1 liter of water, until they reach the desired tint, or we may use a hot solution of 25 to 50 grams ammonium sulphide in 1 liter of water. If the "oxidizing" is to possess luster, it should be brushed or scraped. If it is wished to make certain places brighter than others, this can be done with a potassium-cyanide solution. In order to bring out more the white color of the silver in silver-copper alloys, and give it the appearance of fine silver, recourse may be had to a so called "blanching." For this purpose the red-hot object is dipped in a liquid consisting of one-half liter water, 15 grams tartar and 30 grams cooking salt, or of 1 liter water and 20 grams sulphuric acid. Heating and blanching may need to be repeated.

Gold Coloring

Gold coloring is generally employed to give the objects a rich appearance, also to endow them with a reddish or bright-yellow tone. In order to impart a beautiful pure-gold color, the articles are boiled in a solution of 20 grams saltpeter, 10 grams cooking salt, 10 grams alum, 240 grams water and 10 grams hydrochloric acid (1.12 specific gravity). There may also be made for this purpose a broth of 30 grams alum, 60 grams saltpeter, 30 grams sulphate of zinc and 30 grams cooking salt, this being applied, the object heated on a hot iron plate till it becomes black, after which it is washed with water, scraped with vinegar, and finally washed and dried.

For clouding the gold color, is used the so called gilders' or gold wax. This is twice applied to the object, evaporated over a coal fire, and allowed to run off regularly. After burning off each time, the object is brushed hard, heated and again coated with gilders' wax. For a red-gold color, we fine-pulverize 48 parts of red chalk (reddle or ruddle), 32 of verdigris, 20 of so called copper ashes or scale, 32 parts of zinc sulphate, 16 parts iron vitriol (green vitriol or copperas) and one part of borax, sift the mixture and finally add to it 96 parts melted wax. For bright-gold colors is used a gilders' wax consisting of 96 parts wax, 48 sulphate of zinc and 15 of calcined borax.

Prepared Baths for Metal Coloring

With this I will conclude the special subject of chemical metal coloring. From the foregoing material the reader will get a pretty good idea of the extensive fields of knowledge and experience required to work successfully. An important simplification has been made in recent times, since certain firms have noticed the difficulty in making up baths for a good metal coloring and so have placed on the market a series of prepared baths containing the most useful constituents. I might here mention the Langbein-Pfannhauser Werke, in Leipzig-Sellerhausen, Germany, and select a few special processes of this firm. For instance, their browning fluids, called "Ferroxydin" and "Brillantschwarzlösung" ("Brilliant Black Solution") have for years been extensively used in a good many industrial works. This firm has also considered the great need of a cheap process for blackening small iron objects, such as buckles, buttons and hooks, and has therefore commercially brought out its "Diamond Black" method. By simply dipping in the heated bath and then washing off well with water, a deep black oxidation is produced. A careful removal of grease, which in all other processes is absolutely necessary, is here superfluous.

To facilitate the production of metal colors, where a previous coppering of the object is necessary, there are now obtainable galvanic baths in the form of salts, which reduce to child's play the experience necessary for making up the baths. In this province, the Chemische Fabrik aus Aktien (vorm E. Schering), Berlin N., Germany, is a pioneer with its "Metall-Trisolytes."

Preservation of the Color

But in spite of all means, good metal coloring is and will always remain, an art to be learned. I hope that these lines may contribute something to achieving it. In conclusion will only be mentioned the means and ways necessary to preserve to the objects their color and artificially produced appearance.

After the article has reached its desired color, it is, as a rule, well washed with water and quickly rubbed dry with clean sawdust. Then, if not highly polished just before the coloring, it appears quite dull and, for improving its looks, requires a further treatment, which usually consists in a thorough brushing with hard or soft brushes, as occasion requires. By this aftertreatment, the article is brought to a certain regularity, and is more agreeable to the eye. This treatment affords also a certain protection against atmospheric influences. A far more efficient protection, however, may be obtained by covering it with a colorless lacquer or varnish. While formerly a spirit lacquer (such perhaps as an alcohol solution of shellac) was usually employed, now it is almost entirely replaced by Japan lacquer, that is, a celluloid solution in acetone, or the like. Small objects are coated with this lacquer by dipping, larger ones by rubbing it on. These lacquers have the advantage that they are extremely solid after drying, and are insoluble in almost all fluids. They may therefore readily be washed with soapy water.

In closing I must only reiterate my advice, first to experiment with samples of the material in hand before proceeding to color an article for actual use.

Different Practice in Truing Axle Journals

There are many things to consider when we come to design machinery for the market, that are not apparent at first glance. If we had an inquiry from the Short Line railroad for a machine to repair car-axle journals, we would, of course, inquire about their practice in regard to wheels. On finding that they always remove the wheels before truing, we go ahead and design the machine accordingly. Then, after it is designed and patterns made, we find that the Lake View railroad never remove the wheels to repair journals, so that we must make them a special machine so as to swing the car wheels.

The Short Line practice was adopted because it had been found that the wheels needed truing up at the time the journal needed repairs, while the Lake View had a machine that would true the wheels in place. So there was a reason for both ways.

But the funny part of it all is that the Short Line shops now have a machine for truing wheels in place but have evidently forgotten it, so that they still take the wheels off just the same. It is a case where the information in regard to new machines and methods has not been as thoroughly distributed and absorbed as it should be. So, before designing a new machine for the general market, it is a good plan to find out what more than one probable customer is doing.

New York City uses about 430,000,000 gallons of water per day. This would fill a lake one mile long by a fifth of a mile wide, to an average depth of 10 feet. With a drop of 20 feet and a turbine of 80 per cent. efficiency, this would develop 1200 horsepower continuously day and night. If the whole quantity were allowed to flow in 10 hours, the horsepower developed would be 2900, all during this latter time.

Assembling and Testing Motors

Editorial Correspondence

Two convenient stands for assembling automobile motors; a method of cranking them by motor to save time and labor; weighing reciprocating parts to secure a well balanced motor.

Fig. 1 shows the assembling stand used in the E-M-F factory for the assembling of the motors. This consists of a substantial wooden bench having arms *A B* at the side of each end of the bench. The motors are clamped by means of the eccentric washers *C* which go through the opening in the cross member and clamp it between these two washers. Being held on each side in this way, it is an easy matter to tip the motor into almost any desired position, so as to conveniently get at any part of it. Two positions are shown, but these are by no means the limit of its possibilities.

Fig. 2 shows an entirely different type of assembling stand used at the shop making the Flanders motors. This motor has a frame with a steel tube through each end of the cross members, and in the position shown. In the illustration all the motors happen to be in an upright position, but it will be readily seen that the raised arms at the back of the assembling stand are made to receive the outer tube when the motor is swung up, using the rear tube as a trunnion.

These arms are just back of the center of the rear tubes; and this holds the motor firmly in place in a position which is nearly horizontal and allows easy access of the crank case and all parts underneath. It will also be noticed that a light overhead traveling crane is provided for lifting these in and out of the assembling stand so as to avoid as much labor as possible.

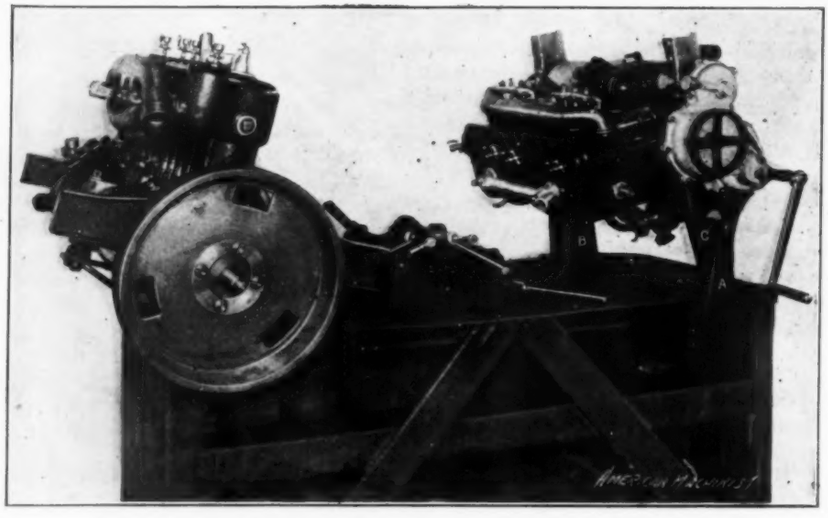


FIG. 1. E-M-F ASSEMBLING STAND

CRANKING WITH AN ELECTRIC MOTOR

Fig. 3 shows the testing room in the Flanders plant, and gives some idea of the number of motors which can be tested at the same time. The electric motor shown mounted on the small truck in the foreground is for starting or cranking the motors, or for running them temporarily, should it be necessary for any reason. The starting is done by the endless belt shown on the motor, going over the small pulley and then over the large clutch pulley on the end of the motor. This saves considerable manual effort which becomes very motononous, as well as decidedly laborious where a large number of motors are tested each day.

WEIGHING RECIPROCATING PARTS

Fig. 4 shows the corner of the assembling department where the E-M-F pistons and connecting rods are selected for each individual motor.

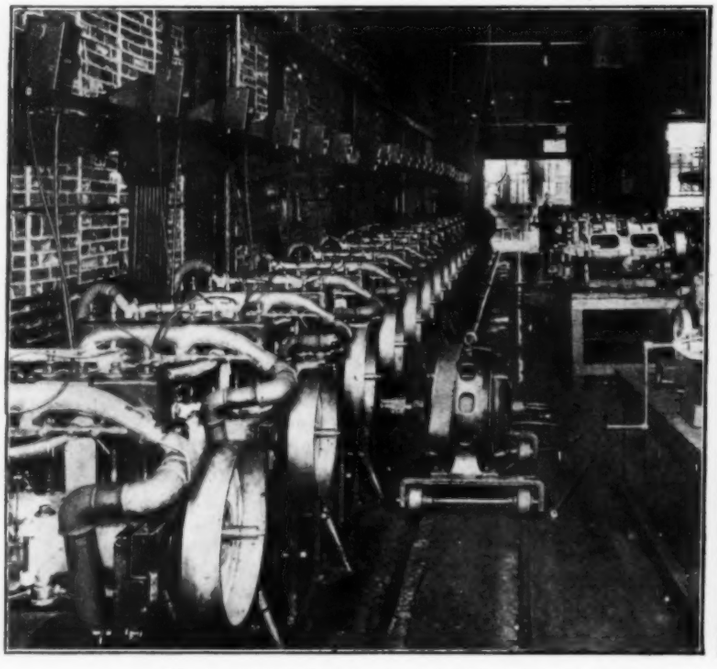


FIG. 3. CRANKING MOTORS BY POWER

FIG. 4. WEIGHING RECIPROCATING PARTS

FIG. 2. FLANDERS ASSEMBLING STAND

As can be seen at the extreme left, a complete piston, connecting rod and piston pin is on each pan of the scale shown. This insures their being of equal weight, regardless of what that exact weight may be. These are marked in sets of four, so as to insure the reciprocating parts of each motor being of the same weight, making the motor run much more steadily.

In a report of the Bureau of Census covering the automobile industry it is noted that there is a perceptible general trend in the automobile industry toward specialization, which is manifested in a marked degree in all branches of the manufacture of vehicles. Much of the manufacture of automobiles consists of assembling the finished parts made by other establishments either as chief or minor products. Of the latter, foundries, machine shops, wheel works, body builders, rubber-goods manufacturers, top makers, etc., will be found to furnish the greater values. Independently of the factories which produce complete machines and parts incidentally, there is another group of establishments which produce bodies and parts.. There were, in 1909, 476 such establishments reported to be in operation, with a product valued at $55,544,700.

Packing Machinery for Export

By Francis H. Davies *

A needed reiteration of the importance of packing goods to withstand rough handling, moisture and perhaps insects and vermin. Yet packing can be too heavy and thus add unnecessarily to transportation charges.

All markings must be in simple language and plain letters and figures.

*Consulting engineer, London, England.

Everyone who has had much experience of the practical side of exporting or importing machinery and fragile engineering goods should be able to appraise at its right value the importance of careful packing. It will not be denied that it pays all the parties concerned, reduces the cost of breakages, and obviates the delay which so often arises therefrom. So important is this point that a firm with a good reputation for careful packing will in competition secure export business for this reason alone, yet the fact remains that there are many exporting houses doing a large trade which, judging from results, do not bestow anything like sufficient care upon this department of their business. Little that is new can be said upon the subject, but its salient features will not suffer by reiteration.

It is first of all necessary to appreciate that conditions of transport and handling differ materially in various parts of the world; it is also essential to realize the possibility if not the probability of the machinery and labor at the port of destination being very inferior to that at the home end. Dock laborers of a civilized race may be credited with sufficient intelligence to handle goods with a certain amount of care, and to take at least some slight notice of the usual inscriptions such as "fragile," "this side up," provided the wording is in their own language. On the other hand, the Asiatic or African native laborer is not to be so credited, and warning notices upon the cases in any language are wasted upon him for the simple reason that he cannot read. It is not indeed going too far to say that even if he were able to understand such directions he would in all probability ignore them and simply consult his own convenience. That such is the case is well known to all who have handled native labor, and in some respects certain of the white races are very little better.

Observation at any wharf or freight yard will show that cases, bales, and indeed most classes of merchandise are handled in much the same manner, and little regard is paid to the comparative value or fragility, however plainly it may be indicated. The human element is certainly the one to be most feared, but the possibility of inefficient mechanical arrangements for handling the goods must also be reckoned with.

This at first sight would appear only to apply to countries of the semi-civilized class, but such is by no means the case, as the ultimate destination of goods is often some obscure country town where little if any conveniences for handling heavy or bulky cases are available. In these instances they will be slid or dropped instead of being slung, and the probable effect of such treatment should be anticipated. In short, a firm desirous of building up for itself a reputation for good packing must take no chances, but in every instance so order its methods that whatever befalls in reason the charge of carelessness cannot be brought home to it.

THE QUESTION OF CLIMATE

Germane to this is the question of climate; a very important one which is often ignored. A firm doing a large export business should number among its staff a man who has made a special study of climatic conditions, preferably one who knows of them by first-hand experience. He alone will be able to appreciate and forestall the extraordinary rusting effect of sea air, the deleterious action of a hot, damp climate, the attacks of insects and vermin whose habits are unknown outside the country in which they swarm, and the thousand and one other conditions which are peculiar to certain localities and, therefore, foreign to the experience of people who have

not actually dealt with them. If for one reason or another such an appointment cannot be made, it is within the power of any firm to institute through inquiries as to the conditions obtaining abroad, and to see that packing is carried out in a manner that fully meets them.

A course of action which has often been urged upon firms whose export business would warrant it is that the exigencies of packing should be allowed to have due bearing upon the design of their products. Some make a feature of this, and their machines are distinguished by the absence of awkward and fragile projecting parts, also by the manner in which they pack conveniently in pieces. Others have obviously never given the matter a thought, with the result that packing is costly and difficult and breakages by no means rare. It should be an axiom that cases and their contents should not weigh more than, say, four to five tons if it can be avoided. If difficulty in erection is not likely to result, heavy machinery should be split up into even lower weights. All bright or other parts which are in the least likely to rust should be carefully painted with a good grease of proved value, and tapped holes, which are usually neglected, should be treated in the same way and also plugged with wood to keep out dirt and grit.

Points in Packing

Struts should be provided to take the weight of heavy projecting parts, as it is these which are most likely to suffer. They can only be properly protected by so staying them that they form part of a rigid whole. Needless to say, machinery must be securely fastened to its case, preferably by bolts; chocks and wedges will only serve in the case of light articles. It is also necessary to remember that the contents of a packing case should be so secured that no part will move under any conditions. It is impossible to say which side will be uppermost when a case is transhipped, and as probably all sides will have had their turn before the journey's end, the only thing to do is to make sure by proper fixing that no harm will result.

It has been suggested that a fairly sure way of insuring that a heavy case will be kept right side up is to fit the bottom with runners suitable for working over rollers. These will no doubt be taken advantage of and the expedient is worth trying.

To facilitate assembly, parts of one machine packed in several cases should be labeled distinctly so that by aid of a drawing the whole may be put together. Small parts and fittings may, if necessary, be put in the same cases as the larger sections, but they should under no circumstances be left loose, although this is often done.

The construction of the packing case itself is, of course, of primary importance. To employ a cheap and fragile kind of wood and to stint its thickness is a mistake. For heavy machinery the planks should be from 1½ to 2 inches thick, so that in addition to being practically immune from breakage they will not bend with a blow or from pressure. It is essential that the planks forming the sides should be well fixed together by cross fastenings screwed on to the inside of the case. Gluing is of no use and should be avoided. The top and bottom require special attention; the lid, if such be used, should not project beyond the sides in any part. In this connection the point to bear in mind is that the outside of the case should be as smooth and regular as possible, as projections of any sort are apt to catch and be sheared off.

Finally, a number of strong iron bands should be fastened round the case, and particular care should be paid to their ends in order to prevent their being ripped off to the detriment of the case and possibly of other goods.

Screws are, of course, preferable to wire nails unless the case and its contents are very light, but whichever are used there should be some indicating mark to show where to start opening the case. This useful precaution is often neglected, with the result that unnecessary damage is done to the package and a good deal of time wasted. Forethought in this direction will materially help matters at the Customs; it will be found a good plan so to design the case that a certain marked plank can be readily removed to allow of examination.

Cases Should Not Be Too Heavy

It is decidedly not a usual fault, but at the same time it must be recognized that it is quite possible to go too far in the direction of strength and, therefore, weight of packing cases. I have in mind an instance where a consignment of electric lamps was shipped abroad to my order. Of the first batch 40 per cent. arrived broken owing to being badly packed in a flimsy case. The shippers resolved to do better with the next consignment, and in addition to careful packing provided a very substantial case of considerable weight. The lamps certainly arrived safely with a low percentage of breakages, but financially, the result was as bad as before; owing to excessive weight the cost of carriage worked out at 12 cents per lamp. These two instances serve to show the irresponsible manner in which many firms go about their export business, and also indicate that judgment and experience are both essential in the packing department.

Zinc Linings

The practice of lining cases with an air and water-tight zinc lining is necessary with delicate electrical machinery or instruments, but for ordinary engineer's goods it is not essential, as oiled paper or cloth will generally suffice. If the expense is to be incurred it is as well to make sure the job is done thoroughly and not scrimped as is often the case. Such linings to be of real use must be properly tight in every part, and particular care should be taken that nails are not inadvertently driven through them in closing down the boards.

The soft packing used in the interior of the case is an important matter. The best is wood shavings, and the worst is probably straw. This latter often contains a good deal of moisture, particularly if the packing is done in the winter months, and when the goods enter a warmer climate they are subjected to a steamy atmosphere which will give rise to rusting in a very short time. For this reason it is also desirable to make sure the cases themselves are not damp, and if there be any doubt about this it is a good plan to dry them out with unslaked lime.

The futility of relying upon printed marks and directions has been pointed out, but the fact that they are often ignored does not warrant their discontinuance. There may always be someone who understands them and will act accordingly, and provided the right language is used they are certainly worth while. The whole contention is that they should in no sense be relied upon and that proper precautions should be taken to meet every possible contingency. As regards the essential markings relating to gross and net weights, names of consignor and consignee, destination, etc., the plainest and simplest class of letter not less than 2 inches high is the best. An indelible ink or paint should be used, and the marks should be repeated on several sides. It is also important that all old marks should be thoroughly erased if a case is being used a second time.

Precautionary measures such as many of the above are very obvious, and it seems extraordinary that they should be so often neglected. The fact that they are indicates clearly that packing is too frequently looked upon as a necessary nuisance, and not, as it should be, as one of the most important sections of a manufacturing business.

According to the Consolidated Gas Company of New York City, it requires 810,000 tons of coal per year to make gas for the boroughs of Manhattan and the Bronx. This means 20,250 cars of 40 tons capacity each, or a train about 130 miles long. With this coal, 90,000,000 gallons of oil also are used. Figuring this on its equivalent heating value in coal, and allowing 3.7 pounds of coal per horsepower-hour, this fuel would develop 80,000 horsepower for one year of 365 days of 24 hours each. For 300 days of 10 hours each, it would develop 234,000 horsepower.

Design of Eyebolts and Lifting Eyes*

By Axel K. Pedersen

Designing of lifting members made easy. Chart is based upon the curved-beam theory of Professor Bach.

There is hardly any machine member where so much guesswork and so little calculation is employed as in the design of eyebolts and lifting-eyes, the reason for this being the general lack of information on this point in the technical literature; this is entirely out of proportion to the importance of the subject. The proper and safe dimensioning of these everyday-used lifting tools is most important, especially in cases where the successful handling and ultimate erecting of expensive, heavy machinery is wholly dependent on the strength of the lifting tool.

It must be admitted, however, that the application of the theory of the elasticity to the case in question meets with but little success, when the theoretical results are compared to actual tests. In such cases a semi-theoretical method is usually resorted to: If test-data are available, it is often possible to introduce a correcting factor in the analysis, thus obtaining reliable formulas for practical use. That theory is logically preferred, which results in a proportionality-formula, giving each of the conditions for the part to be designed and all of the dimensions their due weight and proper influence upon the result. Generally, it can be stated, that such a formula is found, if the introduction of a constant factor brings the results in accordance with practical tests.

It should seem to be evident, that a theory considering the eye of the lifting member to be fixed in a horizontal plane at two diametrical opposite points and treating it as a straight beam, loaded at the middle, or a "theory" which neglects the bending action of the load altogether and calculates the stress from pure tension forces (one-half of the load divided by the area of the cross-section of the eye), have no logical foundation whatsoever. With reference to the application of the straight-beam theory, the influence of the eyebolt-shank upon the strength of the eye is neglected, thus giving the three lifting members, shown in Figs. 1, 2 and 3, the same relative strength for equal loads; furthermore, the tensile stresses

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are greatly overestimated, considerably exceeding those obtained by any other method, and are not in an approximately constant ratio to the actual stresses produced. If the bending action of the load is neglected, the stresses are under-estimated, nor are they in a constant ratio to the actual stresses.

The only theory to be employed logically, seems to be the one which takes into account the curvature of the eye. Unfortunately, however, even this theory results in formulas greatly overestimating the stresses actually produced in the eye, as far as it can be concluded from available test-data.

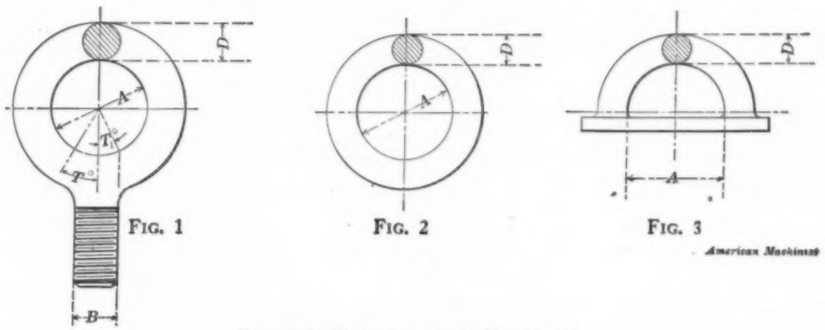


FIG. 1 FIG. 2 FIG. 3

LIFTING MEMBERS AND NOTATION

ANALYTICAL INVESTIGATION OF THEORY

Though in full cognizance of this fact, I have undertaken to base the analytical investigation upon Professor Bach's general theory of eccentric loaded curved beams, the reasons warranting this preference being made sufficiently clear by the following statements:

Any attempt scientifically to analyze this subject has usually employed the above theory. Furthermore, it readily permits a discrimination between the three cases, Figs. 1, 2 and 3. The general case for lifting tools of this form is the eyebolt. It is assumed, that the shank of diameter B renders a part of the eye, intercepted by twice the angle T, absolutely unyielding and, therefore, creates a certain resistance to the collapsing forces in the eye. The relative strength of the three lifting members is thus readily ascertained; from the examples calculated below quite a difference in capacity will be noted.

The principal advantage of this method, however, consists in the possibility of introducing a constant proportionate factor in the resulting formulas, thus rendering them consistent with experiments.

The application involves rather complicated calculations, the mathematical investigation being so extensive, that it could not be given here; furthermore, as the resulting formulas are unhandy and cumbersome to use for the prompt determining of the required dimensions, the chart printed should prove itself very convenient for practical use.

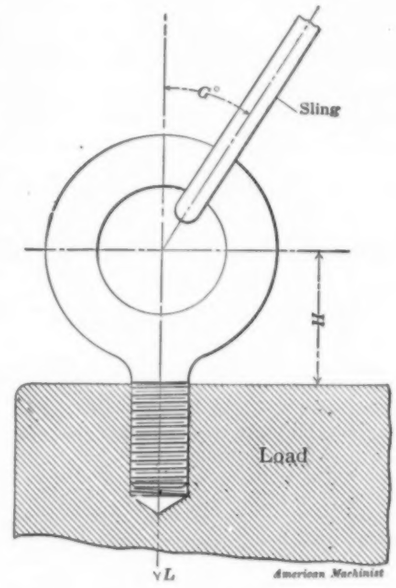


FIG. 4. LIFTING EYE USING TWO SLUGS

The chart determines the dimension D in inches, having given A and (for Fig. 1) B in inches, P the load in pounds and s the maximum allowable tensile stress in pounds per square inch, occurring in the eye. T in Fig. 1 is one-half of the angle which includes the unyielding part of the eye; for Fig. 2, the angle $T = O$, and for Fig. 3, $T = 90$ degrees.

Calculate the factor

$$F = \frac{m \cdot s \cdot A^2}{P},$$

using $m = 2.0$ as proportionate factor.

Then, locate F on the F-scale and trace parallel to the z-scale to the proper curve among the curves for values of sine of T, and read the value of z on the z-scale. Then the dimension D is:

$$D = z \times A.$$

To employ the proper curve for sine of T, the following rules must be observed:

For Fig. 1: Calculate the value of

Designing Chart for Lifting Eyes—By Axel K. Pedersen

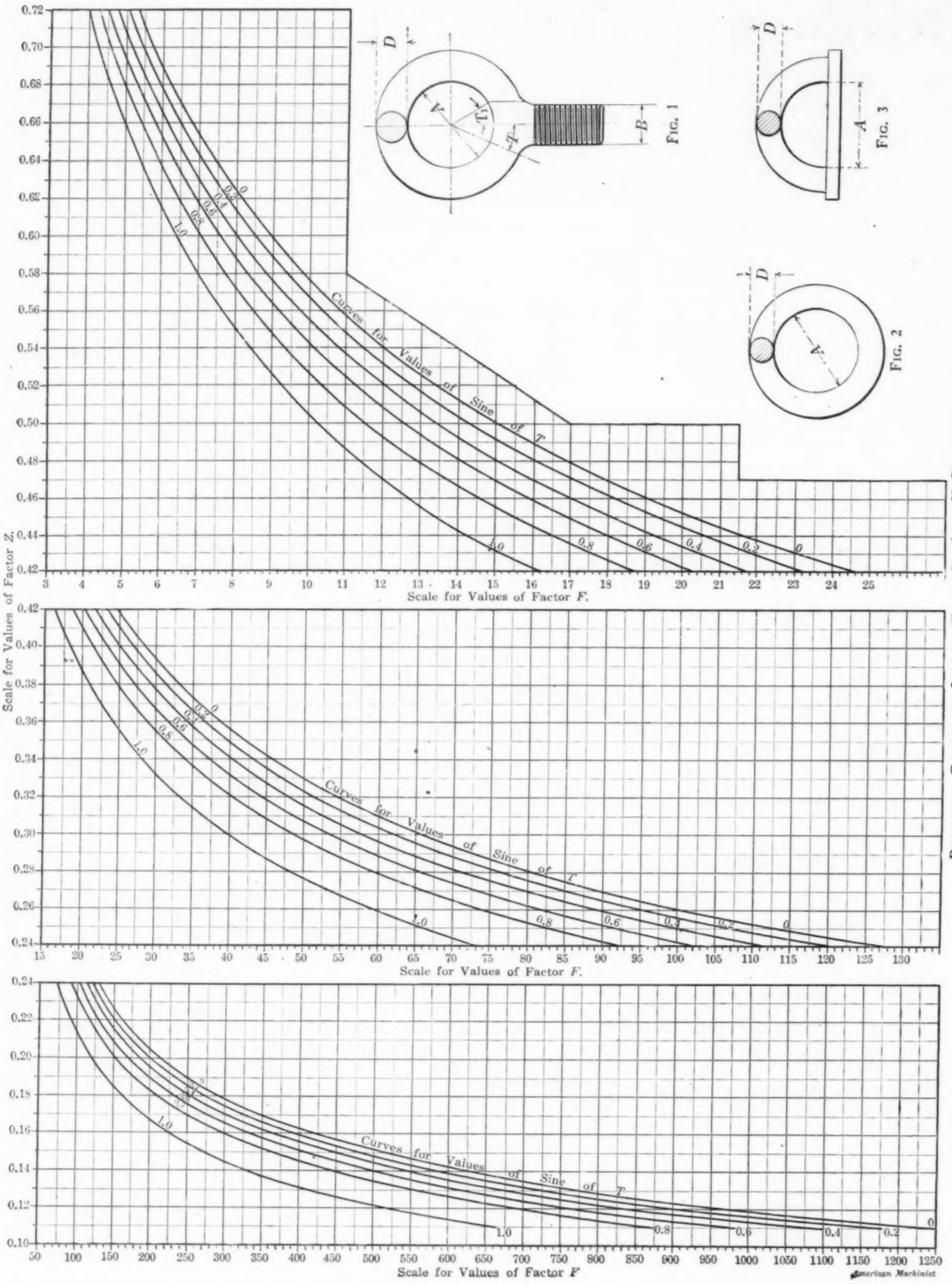

Scale for Values of Factor Z.
Curves for Values of Sine of T
Scale for Values of Factor F.
Scale for Values of Factor Z.
Curves for Values of Sine of T
Scale for Values of Factor F.
Curves for Values of Sine of T
Scale for Values of Factor F
American Machinist

Fig. 1

Fig. 3

Fig. 2

sine of T approximately from sine of T, = the ratio $B \div A$.

For Fig. 2: Use the curve sine of $T = O$.

For Fig. 3: Use the curve sine of $T = 1.0$.

Allowable stresses:

For the eye: Maximum stress allowed $= \frac{2}{5}$ of the elastic limit of the iron used.

For the shank: Maximum stress $= \frac{1}{3}$ of the elastic limit of the iron used.

An Experimental Investigation

The proportionate factor was determined from tests, conducted at the testing-laboratory of the General Electric Company, Schenectady, N. Y. By the courtesy of this company the test-report is hereby given.

Eyebolts were made up leaving the shank unthreaded. Stress was applied to a pin run through the eye of the bolt by means of a clevis, the shank of the bolt being gripped solidly in the jaws of the testing machine. Prick-punch marks were made at the upper and lower ends of the eye and in these marks were inserted the points of a tram. By this means the amount of elongation of the eye at the yield point was determined fairly accurately by the eye of the observer. The yield point was determined by the drop of the beam of the testing machine, checked by noting the point at which the length between the prick punch marks began to increase rapidly. In all tests the drop of the beam and the increase in the rate of extension of the eye happened at the same time, thus insuring the accuracy of the placing of the yield point.

In Table I the test-results are given, the letters referring to the dimensions of the bolts as follows:

A = Inside diameter of eye,
B = Diameter of shank,
D = Diameter of stock in eye,
E = Diameter of pin passing through the eye and to which stress was applied.

W denotes the load in pounds at the yield point.

The bolts were forged from double refined iron with a weld. Tests on samples cut from the same bars, from which the eyebolts were made, gave the following results:

Tensile strength = 48,000 pounds per square inch.

Yield point = 28,000 pounds per square inch.

Now according to the analysis, the factor F in the formula

$$F = \frac{s \cdot A^2}{P},$$

is likewise a function of the dimensions of the lifting tool.

The procedure was then to calculate the experimental factor F_1, from above formula, using for s the yield-point stress, or 28,000 pounds per square inch, and for P the load at the yield point, or W. The factor F_1 was then compared with the theoretical factor F_2, determined as follows:

In the table the ratios $D \div A = z$ and $B \div A = sin.\ T$ were calculated according to the dimensions of the test-specimens. Locating the ratio z on the z-scale of the chart, and employing the proper curve for the ratio $sin.\ T$, the corresponding theoretical value F_2 was read on the F-scale.

Evidently, then, the proportionate factor to be used is the ratio $F_2 \div F_1$ and is the ratio of the theoretical stress to the actual. In the table the letter m gives the values of this proportionate factor. It will be noted that it is nearly a constant, thus insuring the reliability of the analysis within the test-limits, if it is introduced in the stress formula. The average value is 2.2, a value $m = 2.0$, however, is recommended for practical use, as a smaller value increases the safety of the design, and eliminates any danger due to possible inaccuracy in testing.

In the analysis only the tensile stress was considered, the compression-stress, though theoretically considerably greater, practically not so dangerous, rapidly decreasing for increasing values of $sin.\ T$, that is, decreasing the greater the unyielding part of the eye; furthermore, a possible distribution of the load over an arc at the place of contact tends to decrease its value; it is moreover confined to a small part of the eye with a probably ready apportionment to the adjoining less strained parts.

No.	A	B	D	E	W	B ÷ A	B ÷ A	F_1	F_2	$F_2 \div F_1$ or m
1	6″	2.20″	1.92″	3″	44,000	0.320	0.367	22.9	48.5	2.11
2	6″	2.26″	1.88″	3″	44,500	0.314	0.377	22.6	51.3	2.25
3	5″	2.05″	1.74″	3″	40,000	0.348	0.410	17.5	37.5	2.11
4	5″	1.89″	1.76″	3″	39,500	0.352	0.378	17.7	37.0	2.09
5	4″	1.77″	1.48″	3″	30,000	0.370	0.442	14.9	31.0	2.08
6	4″	1.78″	1.46″	3″	32,000	0.365	0.445	14.0	31.5	2.25
7	3″	1.65″	1.25″	2″	30,000	0.416	0.550	8.4	21.0	2.50
8	3″	1.65″	1.27″	2″	28,000	0.424	0.550	9.0	20.0	2.32
							Average $F_2 \div F_1$			2.2

TABLE 1. LOG OF TESTS ON LIFTING EYES.

In calculating the shank of the eyebolt, account should be taken of any bending action of the load. Even for *straight lifts*, that is, lifts in the direction of the shank, it is practically impossible to avoid this bending tendency; only a low stress should therefore be allowed: For straight lifts a maximum stress in the shank equal to one-third of the elastic limit of the iron may still be considered safe.

If two or more eyebolts are used in connection with slings, making an angle with each other, the shank is subjected to a heavy bending; shoulder eyebolts or a suitable spreader should be used, whenever possible. If shoulder eyebolts are employed, care should be taken to have the shoulder tight against the part to be lifted; this is often neglected. Generally, however, straight-shank eyebolts are used and, to avoid accidents, stronger eyebolts must be employed than for straight lifts. The safe load can be obtained from the following formula:

$$L = \frac{P}{1 + \frac{H}{b} \cdot tan.\ G}.$$

Herein, referring to Fig. 4,

L = Safe vertical load upon *one* eyebolt, in pounds.
P = Safe load of eyebolt for straight lift, in pounds.
b = Diameter at the bottom of thread, inches.
H (in inches) and G (in degrees) are dimensions explained by Fig. 4.

The formulas from which the chart was plotted are given in Table 2.

Examples of Calculation

Eyebolt for 60,000 pounds load, inside diameter of eye six inches, elastic limit of iron used 30,000 pounds per square inch.

Allowing a stress in the *shank* = $\frac{1}{3} \cdot 30{,}000 = 10{,}000$ pounds per square inch we get the diameter at the bottom of thread from

$$b = \sqrt{\frac{4}{\pi} \cdot \frac{P}{s}} = \sqrt{\frac{4}{\pi} \cdot \frac{P}{10{,}000}} = 0.0113 \sqrt{P} = 0.0113 \sqrt{60{,}000} = 2.77 \text{ inches.}$$

This would give $B = 3\frac{1}{4}$ inches United States standard, $3\frac{1}{2}$ threads per inch, resulting in a slightly lower stress.

Allowing a stress in the *eye* = $\frac{2}{5} \cdot 30{,}000 = 12{,}000$ pounds per square inch we calculate the factor

$$F = \frac{m \cdot s \cdot A^2}{P} = \frac{2 \cdot 12{,}000 \cdot 6^2}{60{,}000} = 14.4$$

and

$$Sin.\ T_1 = \frac{B}{A} = \frac{3.25}{6} = 0.54.$$

Then, using the chart we find

$$z = 0.479$$

and

$$D = z \times A = 0.479 \times 6 = 2.874 = 2\tfrac{7}{8} \text{ inches.}$$

Relative Strength of the Three Lifting Members

Giving each of the three lifting tools, shown in Figs. 1, 2 and 3, the same dimensions, $A = 6$ inches and $D = 2\frac{7}{8}$, as in above example, and denoting the factors F_1, F_2 and F_3 and the loads P_1, P_2 and P_3, respectively, the relative strength can be ascertained by locating $z = 0.479$ on the z-scale, and reversing the method of using the chart, determining the factors $F_1 = 14.4$ (for Fig. 1), $F_2 = 17$ (for Fig. 2) and $F_3 = 11.45$ (for Fig. 3). Then according to formula

$$F = \frac{m \cdot s \cdot A^2}{P}$$

and for equal stresses, we have the proportion:

$$F_1 : F_2 : F_3 = \frac{1}{P_1} : \frac{1}{P_2} : \frac{1}{P_3} = 14.3 : 17.0 : 11.45$$

or for $P = 60{,}000$ pounds (for Fig. 1), we get

$$P_2 = \frac{F_1}{F_2} \cdot P_1 = 51{,}000 \text{ pounds}$$

(for Fig. 2), and

$$P_3 = \frac{F_1}{F_3} \cdot P_1 = 75{,}500 \text{ pounds}$$

(for Fig. 3).

General formula:

$$F = \frac{m \cdot s \cdot A^2}{P} = \frac{2}{\pi} \cdot \frac{1}{z^2} \cdot [K_1 + K_2 (1 + K_3)]$$

$$K_1 = \frac{Sin.\ T - 2 \cdot \dfrac{1 + cos.\ T}{(\pi - arc\ T)(1 + K_4)}}{\dfrac{2\ sin.\ T}{(\pi - arc\ T)(1 + K_4)} - \dfrac{\pi - arc\ T}{sin.\ T} + cos.\ T}$$

$$K_2 = \frac{K_1 \cdot sin.\ T + 1 + cos.\ T}{(\pi - arc\ T)(1 + K_4)} - K_3.$$

$$K_3 = \frac{1}{K_4} \cdot \frac{z}{(1 + 2z)}.$$

$$K_4 = \frac{1}{4} \cdot \left(\frac{z}{1 + z}\right)^2 + \frac{1}{8} \cdot \left(\frac{z}{1 + z}\right)^4$$

$$z = \frac{D}{A}.$$

How to Install a Piecework System

By Ferd. B. Jacobsen

In most uptodate shops in this country the piecework system is in vogue in some shape or form, but in very few has it been started properly and on a scientific basis. After all the foundation is the most important in a system as well as in a building. If it has been placed on a rock bottom it is safe and will stand a heavy storm without any serious damage, but if on the other hand it has been placed on sandy soil, it is liable to be washed away and destroyed or crippled at any time. I wish to inform the reader right here, that in most shops, especially the large ones, the piecework system has not been placed on a rock bottom, but is simply a little improvement on or an addition built on an old and shaky foundation, which in most cases was purely guesswork. In order to get your prices right and once for all get standardized figures upon which to base your estimates and costs (unless the methods and equipment are improved) it is necessary to take time studies, after the efficiency of the operator as well as the machine has been brought as near to 100 per cent. as possible.

The man who takes time studies should not only have some practical experience, but also be a hustler and a good mechanic, who knows his feeds and speeds thoroughly for all materials and for all conditions. He should also know how to run the different machines, so he may be able if necessary to show the operator little machine-shop kinks and how to save time. Never stick to any standard tables, but find out for yourself how coarse feed or how high speed and heavy cut the job will stand without lowering the quality.

Also be sure to ascertain if it is necessary to take more than one cut, as most modern machines are built for heavy service; a result of the new and improved high-speed steels. One or two extra cuts may more than double the cost of any job, so this item is well worth while considering. Of course, it is well to know, that at times it will pay to sacrifice both feed and speed in order to avoid too much grinding and readjusting, but this mostly applies to automatic machines and where it requires much time and accuracy in changing tools.

Beside being a good mechanic it is a very great asset to be a fluent talker, prepared to answer almost any question pertaining to the work, as well as to be convincing so the operator will come to your way of thinking and see the problem in the same light as the ratesetter. Above all try to make the men understand what a great good you are doing for them in trying to better their working conditions, by giving them the best of tools, and once and for all eliminating the nightmare of the working man—the cutting of the prices. When a piece-rate system is put in properly the price cutting becomes a thing of the past as each price is made for a certain machine. It is most important that the ratesetter always be honest in his dealings with the men and always keep his word so they will have confidence in him. This will make it much more pleasant for everybody concerned and avoid labor trouble. It is quite natural that when a new system is started, the men become suspicious and are afraid they are going to be cut not only in prices but also in their earnings. It is very hard to make anybody believe that you can cut a price without reducing the wages. However, my experience has been that by increasing the capacity of the machines, by using higher speeds and feeds as well as a better grade of high-speed steel, and by improving the working conditions generally, it has been possible to reduce the labor cost more than 50 per cent, in spite of which the operator is making just as much or even more than before.

By bettering the working conditions I mean to cut down the loss of time to a minimum. This is done by seeing that the operator has enough tools, that he does not have to wait for his work or material or probably take a truck and go and get it himself—a thing which is practised in a good many places. As soon as the machine stops running the firm as well as the man is losing money, but it is two to one that the firm is the heavier loser. Therefore, make it a point to eliminate all unnecessary loss of time. A man who is quick and accurate at figures can read drawings well, is a good sketcher and has the ability to improve on methods, tools and his fixtures and knows a wrong move when he sees it, makes an ideal piece-rate man.

This combination is very hard to find. The field is practically new and the inducements in many cases are not very great as a good many firms are apt to underestimate the value of the piece-rate man. The work is hard and not of the most agreeable nature. This being a line, it has to be studied thoroughly, and there always remains something to be learned as new machines are built, creating new conditions. This applies mostly to automatic machines and especially where more than one machine is run by one operator or a battery of machines run by a gang, each individual of which shares in the earnings in proportion to their day rate and number of hours worked. It is a very good point to keep in mind, that in the first place, the work has to be done properly, in the second place it should be done economically and at last, but not least, the operator has got to make his day's pay for a day's work—living wages which will enable him to clothe and provide for his family. Remember that he as well as you may have some little tots which he loves and wants to see happy. No living man with his heart in the right place would like to see small children go hungry and suffer and every father with any self-esteem and pride wants to provide properly for his own. Therefore, it is natural that no man likes to see his prices cut. This very question causes more trouble in the labor world than anything I know of and all because the piecework system was not installed properly.

But when you can show the operator how his machine will turn out twice as much work without any serious trouble to himself and he sees that even at half the previous price he can make even more money, and sees that you know it, he will, if he has any intelligence and common sense, become interested and respect you and also even become enthusiastic and help you in your work. Of course, there are the "chronic kickers" and trouble makers of which it will be well to rid yourself in due time.

I always make it clear to the men, that we want them to make as much as they can and that the only thing that will ever cause a reduction is improvement on methods and tools and above all the holding back of production, because the production we have got to have. To make a complete success the rate-setter must have the absolute coöperation of the foreman and the backing of the management. The rate-setter's lot is even at its best a very hard one as anyone connected with the manufacturing end can realize and understand, and he needs all the support he can get. A good memory is in this line, as well as in others, invaluable and in fact one of the most precious details which combined with the others stated before, make up what we may term a production specialist or expert piece-rate man.

Two Interesting Punches and Dies

By A. Whitby

Details of a punch and die which blank and form two distinct articles at each stroke of the press.

Forming a wire handle.

Economy in the use of material, so that there will be the least possible scrap, and few operations are the two great goals of the diemaker, and in the double combination dies shown herewith, which were designed for use in a single-acting press to produce two distinct articles at each stroke, the supreme conditions have been very successfully met.

The stampings made from the tools are shown in the plans and elevations *A* and *B*, Fig. 1. The one shown at *A* is for a can top generally used in the making of coffee or health salt tins, where a small lid is made to fit into the center hole. The second article, shown at *B*, is for a slip-on lid which is used for all kinds of tin boxes, and is formed from the piece of tin that is cut out from the center of the top *A*. This center

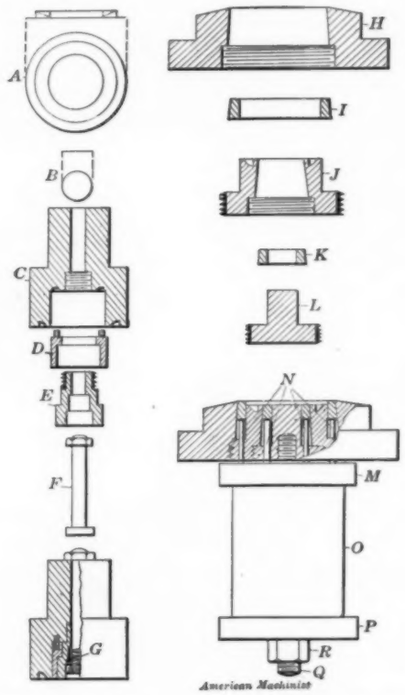


FIG. 1. PUNCH AND DIE FOR FORMING A LEVER-LID CAN TOP AND A SLIP-ON LID AT EACH STROKE OF THE PRESS

piece of metal is very often thrown away as scrap, but by following the method of construction as shown in the drawings, various articles can be made from this waste piece.

If the drawings are carefully noted, it will be seen that the dies perform five operations at each stroke of the press: First, cutting out the outer blank; second, forming this blank into the required shape; third, cutting out the inner blank, or scrap piece; fourth, forming this blank into the required shape, and fifth, embossing or lettering.

A DOUBLE COMPOUND PUNCH AND DIE

In the sketch is a sectional elevation of the punch; *D* is the sliding pressure ring, with coil springs attached; *E* is the inner cutting and drawing punch which is screwed direct into the main punch and *F* is the ejector which slides up and down inside the inner cutting punch and ejects the slip-on lid *B* by the action of the spring shown at *G*.

The main cutting die is shown at *H*, and *I* is the sliding pressure ring which slides up and down the plug for ejecting the can top *A* from the die; *J* is the plug which forms the projection on the can lid, the inside being bored out and acting as a cutting die for cutting out the hole in the can lid *A* and also as a blanking die for the slip-on lid *B*; *K* is the pressure ring and *L* is the punch upon which the slip-on lid is formed.

Just below these parts is a half section of the punch and die complete, showing the plate *M* which carries the pressure pins *N*; the rubber buffer *O* for applying the pressure; plate *P*; spindle *Q* and adjusting nut *R*.

The action of the die is as follows: As the punch descends and enters the die it cuts out the outer and inner blank and continuing downward, the lever-lid top and also the slip-on lid is formed up to the desired shape. The embossing or lettering is also stamped on when the punch is at the bottom of the stroke, and then on the upward stroke of the press the finished articles are ejected by the ejector *F* and pressure ring *I* respectively.

FORMING A WIRE HANDLE

In Fig. 2 are shown the details of a forming punch and die for making wire handles shaped like the one shown in the upper left-hand corner of the cut. This punch and die cuts a piece the correct length from the coil of wire and forms it complete, as shown, at each stroke of the press.

The upper half of the cut shows a side elevation of the tools complete while the lower half is a plan of the bottom die with the wire passing through the straightening rollers and onto the stop, which is adjustable and insures the correct length being cut off for each handle.

DETAILS OF THE PUNCH AND DIE

The punch *A* is made to the section shown and hardened; *B* is the cutting and forming tool which is made to slide in the slide bars *C*, its center *D* being cut out to the size of the outside of the handle; *E* is the mandrel upon which the wire is formed; *F F* are the fingers which tuck the ends of the wire around the mandrel; *G* are springs for releasing the fingers and at the same time bring them into the correct position for the forming of the next handle; *H H* are springs for pulling the slide *B* back into its correct

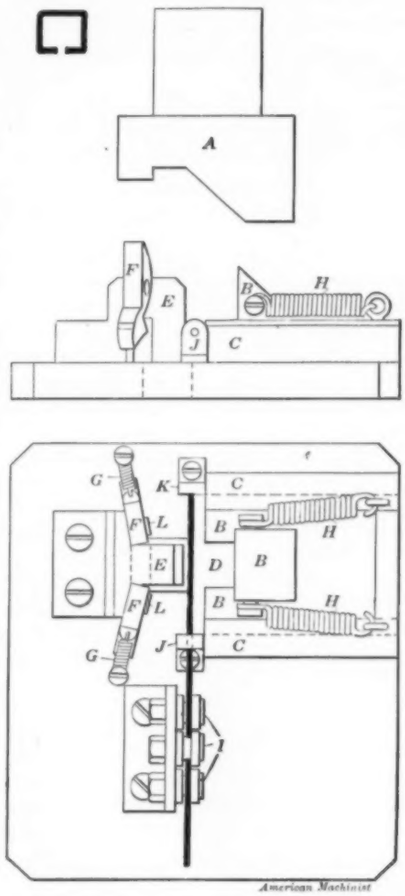


FIG. 2. DETAILS OF A FORMING PUNCH AND DIE FOR WIRE HANDLES

position as shown in the sketches; *I* indicates the straightening rollers; *J* is the cutter block through which the wire passes and *K* is the stop which regulates the length of wire to be cut off.

THE OPERATION OF THE TOOLS

The action of the tools is as follows: The wire is led from a coil through the rollers and cutter block and then on to the stop *K*. The press is then tripped and as the punch descends its angular

projection engages the slide *B*, causing it to move forward and as the edge of the slide passes the hole in the cutter block, the wire is cut off to length. The slide continues to move forward and presses the wire around the mandrel into a U-shape and as the downward stroke of the punch continues, the parallel projection on the opposite end of the punch engages the fingers *F*, which at this point move outward and around the pivot pins *L L*, thus causing the opposite ends of the fingers to move inward toward the ends of the U-shaped wire and onto the center of the mandrel, thereby completing the forming operation.

As the punch ascends the fingers *F* and the slide *B* are released from the handle and brought back to their former position by the springs *G* and *H*. The position of the mandrel where the wire is formed, is made with a slight taper to allow the finished handle to fall off through a hole in the baseplate into the receiving box.

Notes on Modern Pattern-making

By H. A Hartranft

In a recent issue there was given a very interesting article on pioneer patternmaking, taking us back to its very beginning in the Seventeeth century, when very little was known about the art, when patterns that were needed were made by a carpenter or anyone else who was handy with saw and hatchet.

Today the art has advanced and developed so wonderfully that it stands in a class by itself, and is as important a factor in the mechanical world as is machine building and toolmaking, and it should be remembered that it takes just as much skill to make a set of patterns for a machine as it does to build that machine after the castings have been made.

To my mind it often requires more skill to construct patterns than it does to machine the castings. While making no attempt to undervalue the ability of the machinist, still it must be admitted that it is all easy sailing when the machinist sees the casting and drawing side by side.

The patternmaker must study the drawing and must see the pattern in his mind, he must see the parting line, must figure on double and single shrinkage, he must see that this or that part must be cored and must provide for proper finishes for machining. If a patternmaker of the earlier days could look upon the complicated castings of today made possibly in a four- or five-part flask with a network of cores, he would open his eyes in amazement. There are today, however, some manufacturers who have not advanced much over those of long ago who depended on the machinist or millwright for their patterns, and I have a case in mind where the engineer whittles them out with a penknife. It is easy to understand that such a condition cannot bring about good results. The day of the "jack-of-all-trades" has passed and we are now in the age of the specialist, and a patternmaker, if he is one, must have started at it with his first day of work.

The greatest opportunity is offered to the apprentice where there is a foundry connected with the pattern shop and the knowledge which he gains here in four years is invaluable. Here he can see his own work go into the sand, see how it draws and lifts and get pointers which the pattern shop alone cannot give.

Complete Evolution of a Pattern From Drawing to Finished Product

I am going to attempt to describe the different stages of a pattern from the drawing until it is gated up and put on a shelf ready for use. I am now referring to metal patterns. In every well balanced shop there is the usual drawing room with a master mechanic at its head with whom the various new ideas originate. He usually makes a rough sketch of what is wanted and with a few explanations gives it to the draftsman, who draws it accurately with all the necessary views and dimensions. The drawing is then given to the master mechanic for his approval and, after checking it up and finding it correct, the draftsman usually makes several blueprints from it, one for shop use, and one for office reference.

The print is given to the patternmaker, who gets busy making the master pattern on which he allows double shrinkage. It is always advisable to make a master pattern of metal for more than one reason. In the first place, if properly taken care of it will never change its shape or become broken, and, if at any time a change is required, it can be made very easily, especially if the pattern is of a delicate nature. I have known of wooden master patterns that have either lost their shape or fallen apart after lying around the shop for several years and were therefore worthless. This is impossible with the metal pattern. The first cost of the metal master pattern is in most cases greater than that of a wooden one, but it always pays in the long run.

After the master pattern is made, the patternmaker figures out just how many pattern castings he needs to make a full gate. Sometimes only two are required and sometimes as many as 30 or 40, according to size. By a full gate of patterns is meant a gate that will go into a flask about 10x14 inches, which is the most common size in use. These working patterns are usually ordered in iron as they wear better and are not liable to become nicked and dented from continuous use in the foundry, although they are sometimes much harder to finish than brass pattern castings. They should also be ordered pickled instead of rumbled, as it preserves their sharp outline and adds much to their appearance. After the pattern castings are returned from the foundry, the patternmaker sets about finishing them, getting under the scale with scrapers and files and filling up with solder all holes that may be in them. This part of the work is the average machinist's idea of the art of metal pattern making and would class him merely as a filer, which is a great injustice. Truly it does not require a great deal of skill to file up 20 or 30 castings, but it is part of the work and few patternmakers shun it, as patternmaking all the way through is one of the most interesting and instructive trades at which a man can be employed.

After the pattern castings are finished they are ready to be put on the gate, which can be done in several ways. The most common way is by means of pins put in the pattern with a driving fit and then connected to the gate by the usual means of soldering. Another way is to slot the patterns with a circular-milling cutter, usually one-sixteenth of an inch thick and inserting a piece of sheet steel. This makes a gate which is practically indestructible. The width of the stub, which is the connecting link between the pattern and the gate, depends on the size and weight of the pattern and requires judgment. Care must be taken not to get the patterns too close or too far apart, one being as bad as the other. This also requires judgment. This form of gating is known as spray-gating.

Our pattern, gated up with steadying pins in position and properly numbered, is now ready for the foundry to make by the thousands if necessary. In following out this method of making a solid gate on each job one not only gets the best castings that can be gotten, but one is also guarded against the loss of the single loose pattern which must be continually cut off and soldered on a mixed gate. Having a great number of these solid gates the next step is to have a fireproof place in which they can be stored when not in use, and as they are very valuable, no expense should be spared on a suitable vault for their safe keeping. In a shop where there is no such vault their true value is never appreciated until too late and they have been wiped out by a destructive fire. Machines can be replaced immediately, but a lot of patterns that have been destroyed require many weeks to replace, and sometimes cannot be replaced at all because the drawings were destroyed with them. To my mind a good lot of patterns with an equally good place to keep them is a firm's most valuable asset, and too much care cannot be taken to preserve them.

Letters from Practical Men

Concerning the details of making things in machine shops, from the first sketch to the shipping room. A letter good enough to print will be paid for. The value is in the idea—not the length of the letter

Locating a Machine to Prevent Vibration

On first thought, the successful location of a precision testing machine on the fourth floor of a vibrating building seems impossible, but this problem was met by the Hess-Bright Manufacturing Company, of Philadelphia, by means that may be interesting.

The building in question is an ordinary brick structure with fairly good walls but poor floors; a large amount of high-speed machinery on the two lower floors causes an excessive vibration in the upper floors of the building.

The machine to be placed was a special ball-bearing testing machine weighing 2000 pounds described in a prior issue of the AMERICAN MACHINIST. To be capable of frictional observations of minute amount the machine required a solid foundation, and it had formerly been resting on a pier in the ground.

The scheme employed in placing this is illustrated in Figs. 1 and 2.

Knowing the base area required, a triangle large enough to accommodate this was laid out in one corner of the floor. One six-inch channel was set in each wall at the corner, the two almost meeting. These were set in cement and tied to the walls by bolts running to the outside and secured with plates. These channels were then an integral part of the two walls. Resting across these in triangular fashion, and clearing the floor by two inches, are four 8-inch 25-pound I-beams, tied togethed by ¾-inch rods and made solid by plate legs. These beams merely rest on the channel lintels laid in the wall.

A filling of concrete was set in this triangle, making it a massive, solid unit of such size and weight that all small vibrations in the walls, which naturally were at a minimum in the corners due to wave interference, were absorbed.

The machine rested directly on the concrete. The weight of the entire mass, including machine, is about 6000 pounds.

The result is that, while on the floor around this platform, there is excessive vibration, on the platform itself an open pan of water will show barely any appreciable tremor, and the machine is perfectly quiet.

W. L. BATT.

Philadelphia, Penn.

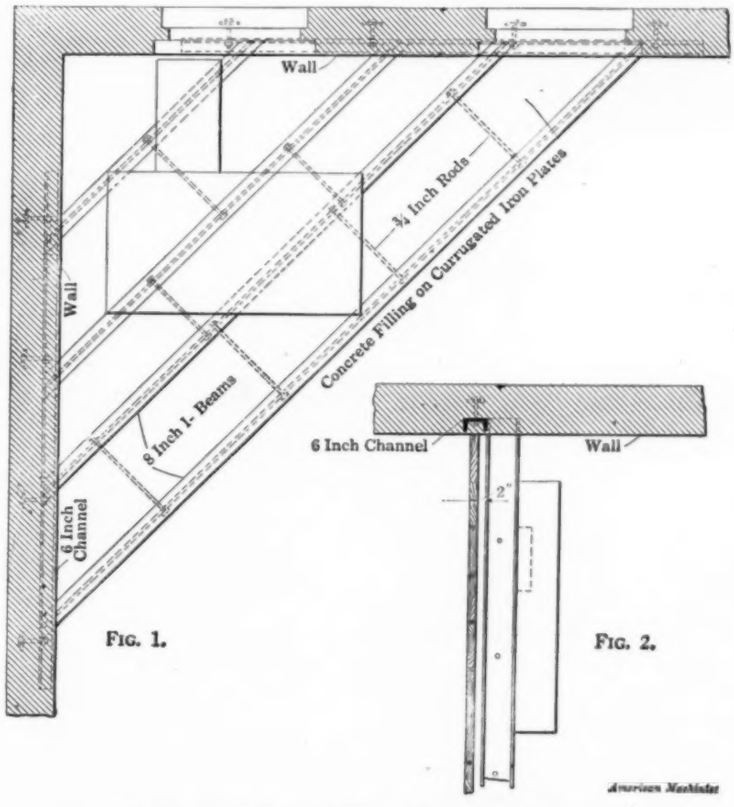
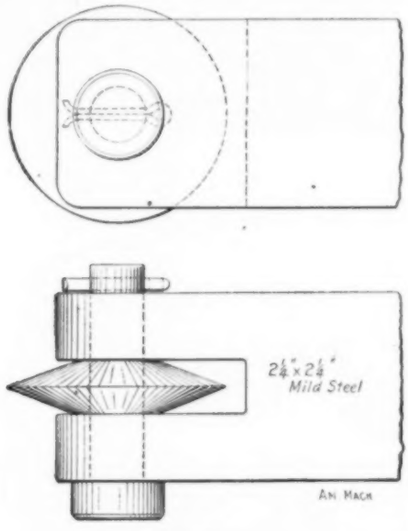


FIG. 1. FIG. 2.

FOUNDATION FOR A PRECISION TESTING MACHINE

Cutting Large Thin Sheets on the Planer

Some time ago we had occasion to cut some large mild-steel plates in sizes suitable to use for steel shelves. We had no plate shears large enough to handle them and in the natural course of events they were given to the blacksmith to cut, but the sweat and language were greatly in excess of the work done and he finally gave it up as a bad job. It was then turned over to the machine-shop foreman to plane them apart on the open-side planer, supposing, of course, that he would use an ordinary parting tool. After breaking several parting tools we made a cutting tool as shown by the accompanying sketch which explains itself. In use the clapper block was locked down so that the tool cut on the return stroke as well as on the forward stroke, lard oil being used as a lubricant. During the last few cuts a light feed was taken and so little bur was left on the edges that it



THE TOOL

was not necessary to touch them with the file. During the last cutting the plates buckled badly and the noise of the buckling could be heard all over the shop, but it was found that as soon as the plates were completely parted they would lie perfectly flat on the planer table.

LEONARD K. FAIRFIELD.

Kenosha, Wisconsin.

Boring and Tapping on the Engine Lathe

In the castings *A*, shown in Fig. 1, the two holes *B* and *C* must be in line with a center hole through which the bolt *F* passes and a positive distance from it, center to center. From *B* to *F* is about ¼ inch more than from *C* to *F*, but in all finished castings these distances must be within very close limits the same.

The center hole was first bored and faced in the flat turret, after which the engine lathe was rigged up at small expense to bore the two holes *B* and *C*. The steel disk *G*, Fig. 2, was turned to fit the hole bored in the center of the casting. It was then carefully located by the two dowel pins *H* and *I*. These dowels were so located that when the disk was in the position shown in Fig. 2 one of the holes could be bored, and when the disk *G* was turned through 180 degrees and the dowels *H* and *I* again put in place the disk was located to bring the other hole in line with the center of the lathe spindle.

The boring tool *D* is a bar carrying a single-pointed tool. One end of the bar fits the taper of the tail spindle, while the other end has a pilot fitting a bushing in the live spindle, thus supporting the bar under the cut. The lever *E* (which is shown on the wrong side of the bed as it was impossible to take the photograph from any other point) takes the strain off the tail spindle.

The tap holder *X* is made of a piece of tubing and has a lever attached to it for the same purpose as *E*. The rear end of the tubular tap holder slips over the pilot on the boring bar, which acts as a guide as the tap is drawn into the work.

New York. E. A. DIXIE.

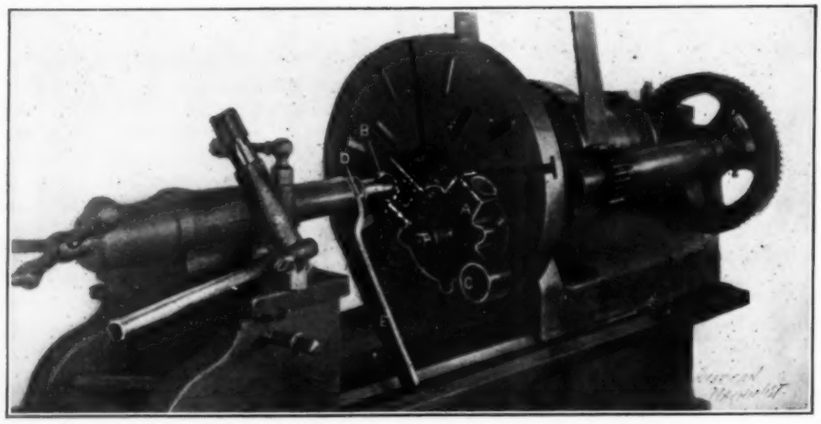


FIG. 1. BORING AND TAPPING ON AN ENGINE LATHE

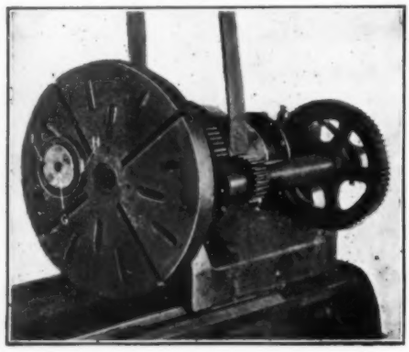


FIG. 2. THE FIXTURE

Fresh Air in the Shop

Never in all my experience as a machinist have I worked in a shop that was properly ventilated.

During the very cold weather one of the workmen gets a little overheated, and raises a window. He may not feel the draft but the dozen or more men back of him do, and it is a case of somebody getting sick, which is altogether too common during the winter months. And this means a machine here and there, idle through the shop. That does not pay dividends.

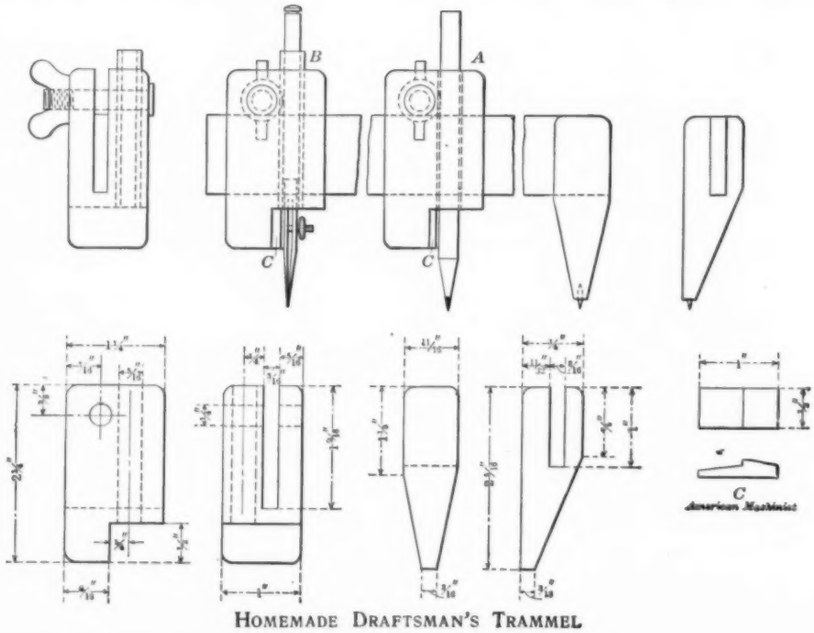
If the windows are nailed down all day and the shop air is foul, then nearly everybody has the hook-worm and as a rule very little work getting done. The stale oil helps this along. Many firms seem to feel that an exhaust fan is too great an expense to install. But if a shop's air is fresh and the temperature moderate the hook-worm will disappear very quickly and the fan will be earning 100 per cent dividends. For the firm who think an exhaust fan too great an expense, I would suggest that they make a few frames to fit in the tops of the windows, 10 inches by the width of the window frames, and cover them with very thin cloth so as to have fresh air without a draft.

They may easily be put in the morning and taken out in the evening, or have all the shop windows opened for 20 or 30 minutes in the morning and closed about 15 minutes, before starting time, and everybody would do a good day's work.

Philadelphia, Penn. W. D. S.

Homemade Draftsman's Trammel

Frequently having occasion to draw circles of a larger radius than could be obtained with a compass, I made a set of trammels as shown in the sketch. Finding them very handy, I thought others might be interested to make a similar set.



HOMEMADE DRAFTSMAN'S TRAMMEL

For a beam I used a piece of cherry 1x3/16x18 inches long. A block, with a small brad for a center, glued to one end of the beam, served for a pivot.

Holder *B* was made with a slot for a sliding fit on the beam. After the desired radius is obtained, the holder is clamped by a wing nut. If the holder is half clamped, a very close adjustment can be obtained by tilting the holder on the beam.

The holder, as shown at *A*, is arranged for pencil work. The hole in the holder is right for a drawing pencil, but a regular ruling pen can be used by the addition of a piece of tubing, as shown at *B*.

When the pen or pencil projects the right amount, it is clamped with a double wedge *C*. The thickness of the wedge is such that, by inserting the small end first, a pencil can be clamped, or by reversing the wedge it will clamp a pen.

The chief advantages of this arrangement over others I have seen are the low first cost and the fact that a standard ruling pen or pencil may be used. Another advantage is that, as the pencil wears, it can be advanced into the holder, keeping the point of the pencil in the same horizontal plane as the pivot center.

ALBERT T. POTTER.

Worcester, Mass.

English Standard Pipe Threads

The accompanying table covering British standard pipe threads as adopted by the Engineering Standards Committee will be found useful in connection with all machinery for the export trade which is equipped with companion flanges. I know of several instances where this information was desired but could not be found in the various hand-books.

J. WILLIAM JONES.

Painted Post, N. Y.

Nominal Inside Diameter Pipe	Approximate Outside Diameter Pipe	Gage Diameter Top of Thread	Depth of Thread	Core Diameter	Number of Threads per Inch
¼″	⅜″	0.383″	0.0230	0.337	28
⅜″	½″	0.518″	0.0335	0.451	19
½″	⅝″	0.656″	0.0335	0.589	19
¾″	⅞″	0.825″	0.0455	0.734	14
1″	1 1/16″	0.902″	0.0455	0.811	14
1¼″	1 5/16″	1.041″	0.0455	0.950	14
1½″	1 9/16″	1.189″	0.0455	1.098	14
1″	1 11/16″	1.309″	0.0580	1.193	11
1¼″	1 15/16″	1.650″	0.0580	1.534	11
1½″	1 13/16″	1.882″	0.0580	1.766	11
1¾″	2 3/16″	2.116″	0.0580	2.000	11
2″	2 3/16″	2.347″	0.0580	2.23	11
2¼″	2 7/16″	2.587″	0.0580	2.471	11
2½″	3″	2.960″	0.0580	2.844	11
2¾″	3 3/16″	3.210″	0.0580	3.094	11
3″	3 5/16″	3.460″	0.0580	3.344	11
3¼″	3 7/16″	3.700″	0.0580	3.584	11
3½″	3 9/16″	3.950″	0.0580	3.834	11
3¾″	4 1/16″	4.200″	0.0580	4.084	11
4″	4 1/16″	4.450″	0.0580	4.334	11
4¼″	4 5/16″	4.950″	0.0580	4.834	11
5″	5 5/16″	5.450″	0.0580	5.334	11
5½″	6″	5.950″	0.0580	5.834	11
6″	6 5/16″	6.450″	0.0580	6.334	11
7″	7 5/16″	7.450″	0.0640	7.322	10
8″	8 5/16″	8.450″	0.0640	8.322	10
9″	9 5/16″	9.450″	0.0640	9.322	10
10″	10 5/16″	10.450″	0.0640	10.322	10
11″	11 5/16″	11.450″	0.0800	11.290	8
12″	12 5/16″	12.450″	0.0800	12.290	8
13″	13 5/16″	13.680″	0.0800	13.520	8
14″	14 5/16″	14.680″	0.0800	14.520	8
15″	15 5/16″	15.680″	0.0800	15.520	8
16″	16 5/16″	16.680″	0.0800	16.520	8
17″	17 5/16″	17.680″	0.0800	17.520	8
18″	18 5/16″	18.680″	0.0800	18.520	8

ENGLISH STANDARD PIPE THREADS

THREADS OF THE STANDARD WHITWORTH FORM

Automatic Press Reel

Taking care of the scrap from a roll-feed press is somewhat of a problem in the press shop. Each shop has its own way of doing this, but I had never seen the coil rewound into a neat coil until we produced the one to be described. All scrap buyers have a different scale of prices. The price depends upon the condition of stock. Compact and uniform bundles or coils will bring a much better price.

In designing this reel the conditions to be met were the following: A reel that would begin to wind at once as soon as the press starts; that would wind the coil tight; that would automatically stop winding the instant you stopped the press for any cause. The removal of the coil with ease was also a consideration. Fig. 1 is a side elevation partly in section. Fig. 2 is a front elevation with the driving pulley in section. This reel is driven by a friction pulley, *A* Fig. 2, in connection with the shaft *B*. The speed is reduced by the worm *C* driving the worm gear *D* which is attached to the spider *E*. The main feature of this machine is the friction shown in section in Fig. 2. The pulley *A* is driven at a speed that will take care of the stock from the press at its maximum feed, anything slower or when the press stops is taken care of by the pulley slipping.

The pulley *A* is held between the two driving flanges *F F*, both of which are fastened to the shaft *B*, one by a taper pin and the other by a key. Friction paper 3/16 inch thick is used between the pulley and the flanges.

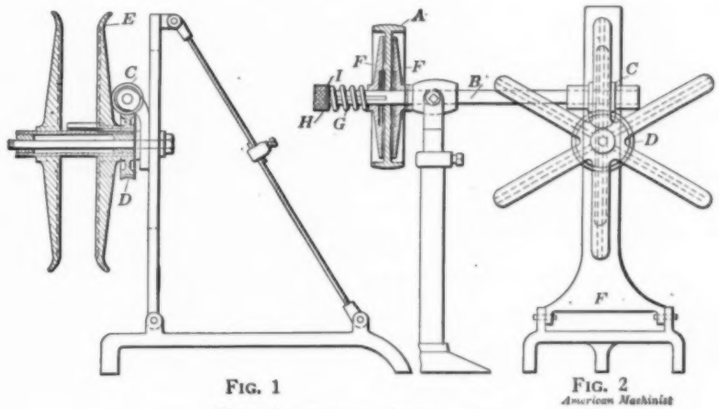


FIG. 1 FIG. 2 *American Machinist*

THE AUTOMATIC PRESS REEL

The coil spring *G* regulates the friction, which may be increased or diminished, by the nurled nut *H*. The washer *I* is between the nut *H* and the spring *G*, it is feathered to the shaft.

This reel is also adjustable for different hight presses and for inclination, features which will be understood without any explanation.

Grand Rapids, Mich. F. C. MASON.

A Kink in Drilling

To drill a hard piece of steel without having clearance wear off the lip of the drill which necessitates repeated grindings, hold the drill firmly in a vise and with a light hammer, strike the face or cutting edge at the outer corners, raising a light bur. This makes the drill cut enough over size for easy clearance and it is surprising how much wear it stands. It is much better than grinding off center and is especially handy in drilling small dies.

Syracuse, N. Y. A. DART.

Drop Press for Shearing in Punches

In the making of blanking punches and dies for stock up to one-sixteenth of an inch in thickness, the amount of clearance between punch and die is very little, varying according to the ideas of the diemakers as to the proper amount. The method of procedure that is quite general, is to make the die first and harden it, then scribe the outline of the die on the punch blank, closely machine file or chip to line, finish fitting by shearing

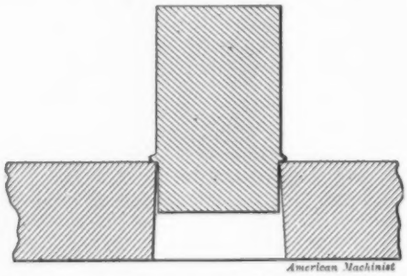


FIG. 1. SHOWING THE WAY THE METAL OF A PUNCH FLOWS WHEN FORCED INTO THE DIE

punch through the die and filing until proper amount of clearance is obtained.

The usual way of shearing in a punch is under a screw press or punch press, but this method has its disadvantages on account of the punch having to be within 0.001 to 0.005 inch of the size of die;

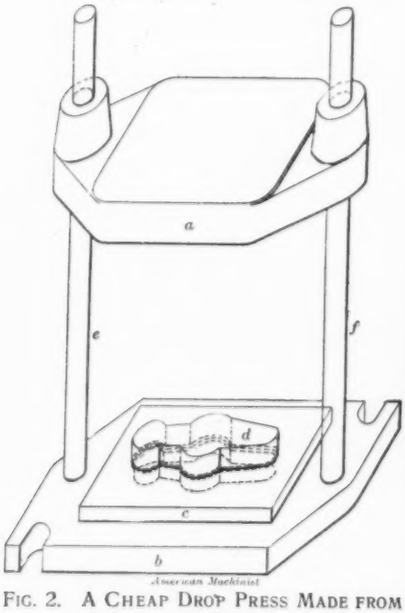


FIG. 2. A CHEAP DROP PRESS MADE FROM SUB-PRESS CASTINGS

making the roughing out of the punch in many instances a very trying and exacting operation.

A much more expeditious method is to use a small drop press and start the punch in the die, then drop it until the shearing-in process is completed. More stock must be allowed for shearing in by this method to keep the punch from wedging its way through the die, as would be the case if the usual amount for shearing were allowed. This method acts a great deal as in swaging, the stock flowing away from the punch as in Fig. 1, and leaving the punch very smooth.

A very cheap yet efficient press can be constructed from ordinary pillar subpress castings, using the plunger for the drop. The pins should be about 30 inches long, and the drop should weigh about 30 pounds, varying according to the work in hand and it should be used upside-down, as in Fig. 2, which allows it to drop face to face with the base or bolster.

When fitting a punch, start the punch in the die as usual and after it has been evened up and started, raise the plunger about 12 inches and let it drop, varying the hight of drop as found necessary. This method leaves the punch a much freer fit in the die than when forced through under a screw press, also as before stated, more stock for fitting must be left when using this method.

Objection might be raised to liability of a punch not shearing in straight, but the ingenuity of the diemaker will be found equal to the occasion. As a matter of practice where this method is used, light, frail punches are fitted in a holder for shearing.

Philadelphia, Penn. J. H. HARRIS.

Cutting Long Half Nuts

The halftones show the method employed in threading three forged-steel half nuts, 10 feet long, ½-inch pitch, square thread, 2-inch bore. These three nuts formed, when joined together, one continuous thread. It being a peculiar job, it will probably interest the readers of the AMERICAN MACHINIST.

The work was fastened on three arches as shown, one of which was bolted to the lathe carriage, the other two running on the V's on babbitted wearing surfaces and were connected by means of threaded rods. The bar was supported by two bearings. Fig. 6 shows the tool end of the boring bar which was fitted up with

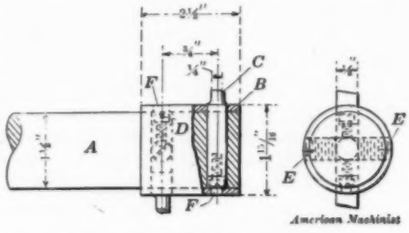


FIG. 6. THE THREADING TOOL

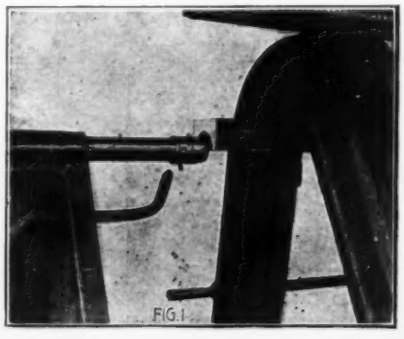
two tools *C*. The bushing *B* is shrunk on the bar. The holes *F* are to allow a screwdriver to reach the adjusting screws *D*. The job was done on a 36-inch Pond lathe.

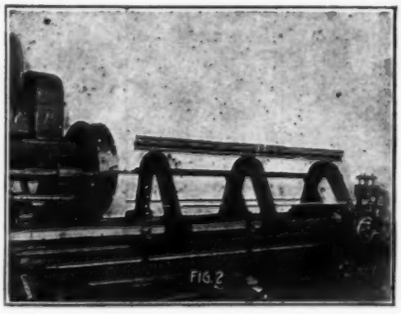
JOHN SPITT.

McKees Rocks, Penn.

Curing a Stuck Bushing

Those of us who are familiar with locomotive practice in the more recent years, and particularly since the advent of piston valves, know that the practice of bushing the cylinder when new is much more common than formerly owing to the high cost of replacing faulty or worn cylinders, as the case may be,





HOW THE WORK WAS DONE

as compared to putting in a new bushing.

One of these latter-day engines was in the round house to receive a new cylinder bushing, and the mere fact of its being in such a place for this kind of repair implies that no time was to be wasted in getting it ready for service again, this being the only disability.

The "back-shop" man delivered the new bushing in the regular course of time after removal of old one, as this is one of the repair parts that has to be finished on the outside to suit each particular case. The machinist on the job proceeded to place the new bushing. The first thing, of course, was to support bushing at proper hight to go into cylinder and then heat cylinder until it had expanded a sufficient amount to receive bushing.

Heating was done by means of an oil burner placed inside the cylinder, the advantage being that after you get the cylinder hot enough, the burner is very quickly removed and there is no sweeping out to be done. Everything worked out as planned until the bushing was about three-fourths through where, as the physicist might say, "The laws of expansion and contraction met." In plain machinist terms, "it stuck."

This was quite a serious matter, as it is rather difficult to heat cylinder and leave bushing cold so it can be tried over; in fact, this difficulty is so great it is not usually given a second thought, much less a serious one. If the "back-shop" man hasn't made bushing small enough to be forced in cold with a jack (which is too lose), the order usually is given to cut bushing off at end of cylinder and fit a piece in other end, although this is rather a makeshift.

Right here is where the machinist on the job began to count. He made a suggestion to his gang foreman that he heat the cylinder, and keep the bushing cool while he did it. Of course, he received his due amount of ridicule, until he explained his plan. He was then directed to the general foreman, where he met with the same derisive laugh, at first, but later was given permission to try it out as it wouldn't take long and was not expensive. This is what he proposed:

Go to a clay bank or bottom and get enough wet clay (blue clay in this instance) to completely fill the inside of bushing; then build a quick, hot fire on outside of cylinder and shove bushing in, with a small screw jack if it is needed. Well, it worked out as he proposed and we can imagine how elated he felt over the result; inasmuch as he had been dubbed "mud dobber," and so on, by his less thoughtful and resourceful fellow workmen.

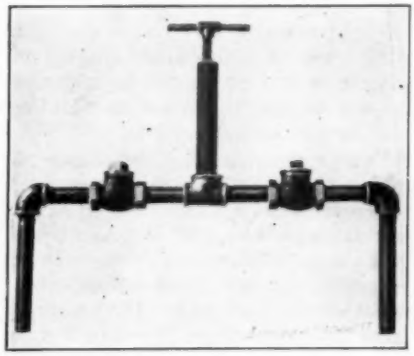
In addition to "putting one over" on the boys, it was a distinct act in favor of the plan of suggestion, that was worth a great deal to the company in a financial way, and that is the way that is always in demand. The wisdom of the foreman and general foreman in following the suggestion saved the company the earnings of this engine for two or three days at least, and lessened cost of repairs at the same time.

The plan worked because it was in accordance with many similar practices of almost any shop. We are familiar with the conductivity of heat tests as applied to reciprocating parts in detecting cracks that are not visible when cold. Heat does not nearly uniformly pass across a joint as compared to solid metal, hence we can see the rupture. I wish I could say that this machinist was promoted at once, but it is safe to say he is on the eligibility list.

Urbana, Ill. E. T. S.

Oil Pump of Pipe Fittings

While engaged on a repair job recently, in a hydraulic turbine power plant, it became necessary to empty the oil reservoir of the thrust bearing of one of the vertical-shaft machines. As these reservoirs seldom need draining, no provision for doing so by gravity had been made by the designer.



OIL PUMP OF PIPE FITTINGS

The space containing the oil was so filled with cooling coils piped to the flume and carrying water to convey away the heat generated by the bearing, that the use of any sort of a dipper was impossible; but, while casting about for other means, the local genius on the job appeared with a hand pump that so well performed its work, and is so easily and cheaply made by anyone having access to a stock of pipe fittings, that it is deemed worthy of being passed on to others who may have need of such a device.

The illustration shows the idea very plainly and is almost self-explanatory. Two check valves, preferably of the horizontal swing variety, though the standard boiler-feed water check is here srown, are necessary. To them connect, as shown, a tee; if a larger opening can be had on the side than at the ends, so much the better, as a large displacement in the barrel of the pump is desirable.

For the barrel, use a piece of brass or steel tubing, if it be handy; if not, smooth black pipe will answer the purpose. A piece of ordinary ½-inch pipe with tee and nipples, as shown, forms a serviceable handle and plunger rod, while the piston is made of a piece of heavy leather held down on the plunger rod by lock nuts and, if large in diameter, washers may be used to give the necessary stiffness.

Care must be used, of course, to have the checks correctly placed, so that both will open in the same direction. Outside these checks the pipe and fittings may be of any combination to suit the purpose of the user. The type here shown, when suitable lengths of vertical pipes are screwed into the elbows, will be found very handy for emptying oil barrels, or pumping out inaccessible oil reservoirs, such as already described.

The simplicity of this device and the case with which it can be put together at short notice, out of almost any size pipe fittings that may be at hand, make it well worth while knowing, especially as suitable proportions make it quick in action, and of large capacity.

H. B. McDERMID.

Sioux Falls, S. D.

A Brass Counterbore

That one does not know it all even after knocking about machine shops for 28 years was again brought home to me the other day when I saw a counterbore made of ordinary drawn-brass rod and used for hard rubber and wood. A hole in the end is threaded so that different-sized pilots can be screwed in. When dull it is readily sharpened with a file. It was made by Thomas D. Greany, instrument maker at Stevens Institute, Hoboken, N. J., who told me it is an old idea with instrument makers; be that as it may, it was new to me.

New York City. J. WATT.

At the Ohio State University they have in vogue a system of compulsory inspection trips which was introduced in 1904 and from short week-end trips the plan has so fully developed that trips of a week's duration are taken by the instructors and students in the electrical- and mechanical-engineering departments. The plan has worked out so well that the students are furnished with printed itineraries and interleaved bulletins for note taking. A trip of this kind, comprising 4 instructors and 100 students of the mechanical- and electrical-engineering departments, left the university at Columbus on April 23, returning April 30, during which time they spent 3 days in Chicago, 2 days in Milwaukee and 1 day in Gary.

Discussion of Previous Question

Letters from our readers showing how many men of many minds look upon various subjects opened up in previous numbers

Ratchetless Ratchet Wrench —An Apology and a Correction

As the editor will remember, an article over my name, published some weeks ago about the ratchetless ratchet wrench, was written in explanation to a letter written by C. E. Church; but his letter being omitted, made the appearance of my letter not only ridiculous, but seemingly a reflection on J. H. Williams & Co., who are furnishing the true ratchetless wrench.

While my wrench, which, as explained in the original article, was made for the express purpose of turning soft finished nuts without bruising, and looked at first sight, and to a certain extent possessed the function of the ratchet principle, which led Mr. Church to conclude it was the same thing, it did not have the rounded jaw, which is the essential feature of the Williams wrench, and it is just this little change that shows the stroke of genius.

It is only in justice that this be given the same prominence in the AMERICAN MACHINIST that was given to my other letter unfortunately published.

Syracuse, N. Y. JOHN E. SWEET.

An Efficient Screwdriver

I wish to reinforce the efficiency of F. J. Clermont's method of preparing a screwdriver for service as described on page 549.

Place the screwdriver in a vise after it has been ground as per Mr. C's method and carefully upset the business end. This will extract or drive a screw and pull a rusty or upset screw where an ordinary screwdriver would fail, as it is sure to do the driving at the bottom of the slot.

CHAS. H. FRANKLIN.

Schenectady, N. Y.

Co-operation of Machine Shop and Pattern Shop

Your leader at pages 223-224 on above subject hits a very sore spot in many shops, particularly where the machine foreman is a man who takes a conscientious interest in his cost bills, and makes a study, so far as lies in his power, of cutting down and improving upon previous performances.

To be handicapped by the inefficiencies or lack of coöperation on the part of other departments over which there is little practical control by the machine-shop foreman, is at once provoking and discouraging.

To my mind, however, the remedy lies in the direction indicated by your leader, viz., by submitting patterns to machine shop before casting, in order that criticism may bring up points where improved facilities for machining may be provided. This appears a somewhat long way round, quite apart from the possibility of their being very radical changes, involving more or less expense, and also loss of time in getting castings made.

I think it will be conceded that the better plan would be to make provision to best help machining in the drawing office, where such points may be most easily studied and alterations or additions most readily made.

This necessitates the drawings passing through the hands of someone qualified by service in the particular machine shop, and whose knowledge of plant and equipment is such as to enable him to say exactly in what order the various operations will be performed. He would require to be acquainted with all tools available, gage systems and other auxiliaries; and what is perhaps one of the most important points, his opinion—developed during his period actually in the shop—should be that which he knows will synchronize with that of the shop foreman, otherwise harmony will be lost and but little advantage gained.

Such a man would be in a position to decide whether it would be better to core a hole or take it out of the solid metal, if the machining allowance should be greater or less than the amount usually allowed.

Also he would be able to say where a foot or projection might be added to assist the setting or machining, or a small facing to act as a gage point. As a rule, this overseeing of drawings before issue would tend to lessen unnecessary work in foundry, but in isolated cases reference could be made, if deemed advisable. If the patternmaker is up to his work he will be able to provide for the most ready means of handling in the foundry, and he may be helped further by indicating, with letters or symbols, in what sequence the various operations are going to be performed, and what those operations are.

Some system, developed on the lines briefly indicated, would appear, in most cases, to help in avoiding unnecessary labor and expense in the departments concerned and at the same time tend toward good relationship.

Glasgow, Scotland. H. P.

Designing Special Machinery

In answer to "Consultation and Machine Design," page 603, I wish to say that I spoke only in general of "Designing Special Machinery" on page 244; as a subject like this in detail would require a whole book of space. There are many conditions in manufacturing where the statements made by Mr. Cooptranft do not agree, and I wish to discuss these questions more thoroughly.

Regarding the theoretical knowledge of a toolmaker, I have often found mechanics who had sufficient training to design tools (and many of them had been draftsmen), but their ability to make tools in the shop is much greater than to design them in the office. It is not only a question of having knowledge, but how and where to use it which requires experience and a certain amount of intelligence. Furthermore, there are toolmakers who have sufficient knowledge and ability to design tools, and yet they have never started because they could not occupy the same relative position in the office as they have in the shop.

I said in the paragraph regarding the running in of the machine, that often the machine to be run in was left only in the hands of the mechanics and so many changes were made that the machine took another character, the original idea being spoiled because of lack of theoretical knowledge on the part of the mechanic to understand the principle of a certain motion, to judge where a change should be made. In a special machine there often are motions whose correctness can be seen only when drawn upon a larger scale, and which to be understood correctly requires a great deal of theoretical knowledge which the average toolmaker does not have. He makes changes which do not always improve the working process of the machine, which could be done with the same expense if the theoretical part could be understood rightly.

Mr. Cooptranft says that he has never found conditions where a designer could consult so many different people and arrive at any conclusion whatever. That is just the business of a designer of special machinery; to find out the conditions, from the buying of raw material to the

selling of the finished product, that he may be better able to design the machine; that its cost, accuracy, etc., will be in harmony with the demand, price, quality, interchangeability and other features of the product produced by the machine. In a special machine there often are mechanisms which are just as new to the designer as to anyone else, but he must be able to solve the problem to a certain degree. In many cases expensive trials in the shop are necessary, and several meetings have to be held, where the manager, chief draftsman, designer, superintendent, and foreman take part, only to discover something along this line. Often the article to be produced is changed in order to make it possible to manufacture it by special machinery.

In building the machine in the shop, the designer does not have to look at the making, as everything ought to be drawn up so as to be understood by the mechanics. But somebody should be there to see that an accurate part receives the necessary attention. The brightest mechanic is liable to misunderstand a mechanism, and somebody should be there to correct him in time.

All special machines are not built only to cheapen the production. Sometimes the interchangeability makes it absolutely necessary to make all parts to a certain degree of accuracy. I know of cases where a part was made cheaper by hand than by the machine. A special machine cannot always be operated by a boy or non-mechanic. There are great numbers of special machines which keep an expert mechanic busy adjusting the machine and examining the output. I have seen in modern plants special machines which required a skilful mechanic and four helpers. The modern manufacturer builds special machinery that is most economical to him in reference to price, place, output, overhead charges, etc., and he does not always follow the rule of using a boy or non-mechanic as operator.

Sometimes there are such intricate and uncertain mechanisms, that they require many re-designs to make the special machine work at all. There are cases where the whole machine has had to be given up on account of its impossibility to do the work which was expected, and in such cases it would require a superhuman designer "to stand or fall alone on his own merit." OTTO E. SEIFFERT.

Philadelphia, Penn.

Correcting Wrongly Drilled Holes

The criticism by Linton Collins on page 603, of a method for correcting wrongly drilled holes, as described on page 72, is an unjust one.

The method as described *is* used, when the occasion arises, in preference to the "usual method of chipping and filing out the hole" as explained, which implies that the problem is not one of extreme accuracy, it being only a drilled hole that is to be corrected. No one would attempt to correct a ¼-inch hole through 3 inches of metal by this method. It is used on such jobs as flanges and bearing caps, etc., on break-down or repair work.

On regular work the usual system of jigs prevents any mistakes in spacing holes in the work.

I believe there are very few men who are attempting to give to the readers of the AMERICAN MACHINIST information on new ways of doing things, who base such information on theory alone.

Since reading the criticism I had a trial made especially to determine the deflection of the drill in passing through the hole; the second time cutting only on one side of the hole.

A 25/32-inch drill was used on a piece of hard cast iron 1⅜ inches thick. A "correction" of ⅛ inch was made and it was found that the oval hole as produced by running the drill through the second time was only 0.008 inch smaller at the bottom than at the top which I consider pretty close for a drilled hole.

Zanesville, Ohio. H. R. GILLIAN.

A Speed Tag

This is the heading of an article by J. W. Knox on page 249. The idea is a very good one and I congratulate the author. I would only suggest that the different feeds be marked on the plate as well. In many cases this is as important and in some cases more so than the speeds. On the blueprints showing the surface speeds of the various dimensions, I would suggest that the materials, for which certain speeds may be suitable, be marked over them, as; soft cast iron, hard cast iron, steel, brass, etc. It is not possible for the foreman at all times to be at hand to instruct the men for every little job.

If using time cards, and arranging the jobs ahead in a rack made for this purpose, it might be practicable to have spaces on the card for speeds and feeds, the foreman filling in how many cuts to take and what speeds and feeds to use. If two rough cuts are necessary, 2 is put alongside of "*rough cut*," and so on. This may be a good stunt and a time saver, as there then will be no excuse for the operator not knowing how to run his machine to suit the different materials and conditions.

Besides, if he is working piece work and the piece prices were based on the time-study plan, the rate setter would from the time studies, make up a table or form on a blueprint showing on what feeds and speeds the time study of the different jobs was based. The foreman of each department would have one of these tables, or the timekeeper or department clerk could have one and therefrom fill in the ticket. If the forms mentioned are made out in the proper way, it does not require any practical knowledge or much skill to understand them.

The ticket being filled out would prevent the operator from not making good, as is often the case, when he does not use the proper feeds. For example, if a certain price on a boring job was figured

S.O.—506	DRWG.—2306	PATT.—BY 506	
PART.—Cylinder		MAT.—C.I.	
OPERATION—Bore			
ROUGH CUT—1		FIN. CUT.—1	
R.P.M., 20	FEED, 1/32	R.P.M., 25	FEED, 1/16
MCH., 208	CHECK, 54	Start, 8 a.m. Fin., 10 a.m.	HOURS, 2
DATE, 2-1-11	PIECES, 4	PRICE, 15c.	TOTAL, 60c.

on 1/16 inch feed per revolution and the operator should only use 1/32 inch it is clear that it would take double the time and consequently the man would run behind, his excuse being that he did not know. I have found this to be the case quite frequently. The newer machines generally have speed and feed plates, but where they are not on put them on by all means.

New York City. FERD. B. JACOBSEN.

Special Turning Job

This job on page 650 is a very easy one and would require, an engine lathe with a taper attachment, a special bracket for working the same, and a master cam. The slide on the taper attachment would have to be of sufficient length to turn the piece 26 inches, and as the slides are usually 24 inches long it would necessitate making new ones.

The process is as follows: The slide should be pivoted at the tail center end instead of the middle as customary. At the other end the bracket is to be fastened. This bracket engages the master cam which is fastened to the lathe faceplate.

The engaging point of the bracket should be fitted with a roller stud, the roll running against the cam to give it free action and held to contact by a suitable spring actuating the slide bar to the cam.

The master cam should be made large and, of course, in proportion to the piece desired. The pivot end of the slide being set exactly central with the starting point on the piece to be turned, there would be no action to the cross slide. As the carriage advances, the elliptic motion begins and, increasing steadily until the piece is finished, thereby turning a piece round at the starting point and producing a tapered oval piece the major axis of which is a gradual increase from beginning to end.

Grand Rapids, Mich. F. C. MASON

Scientific Management

If we did not know the men back of the so called, "scientific management" move, we would be compelled to size them up as men of brains from the mere fact that they have dubbed their work by this general name. It is unfortunate that they were allowed to do this, because it puts any man who differs radically from them in the light of advocating "unscientific management." Of course, we all believe in scientific management, but some of us object to another man taking too much credit to himself for building a slide rule to fit what other people have been evolving since time was young.

Mr. Taylor's most prominent success has been with a man piling pig iron, Mr. Gilbreth's with bricklayers. These two trades are outside the machinist's line, and yet we all know something of them.

The laborer who is piling pig iron for day wages has no motive for thinking about his work, other than the question of how little he can do and not get fired. The man above never handled pig iron and if he had he would not know how much could be piled in a day, because he is physically unable to do a day's work at it. Suppose this employer decides that his gang ought to do only 25 per cent. more work and he insists that they shall or leave. What do they do? Why, they leave just as soon as they can get other jobs. He may show them how they can do the 25 per cent. more work with less effort than they previously put forth, and yet they will not stay with him. Mr. Taylor knew this and, therefore, he increased their pay. Whether this was done on a straight day rate, a flat piece rate or on the premium plan is not essential. The thing that counts is that the man gets more money for doing more work, but not proportionally more. This is nothing especially new; there is not a shadow of doubt that Solomon knew it and it is more than likely that Noah used the same scheme the last few days before the shower.

Mr. Taylor tried two experiments at once, which is unscientific. He ought to have put these laborers at work on the premium plan for a few months and then made his comparisons with that record after he had taught them his schedule for rest cures between jobs. By the way, this is nothing new. We have all seen it. To be sure the average Irishman does not carry his gold watch into the yard with him, but he knows that the time it takes to light a pipe is pretty constant and just about right for the necessary relaxation of the muscles of the arms. Of course, the elimination of two-thirds of your laborers, if accomplished by the weeding out of seven-eighths of the original crowd, means that a very select crowd has to be found. That work of some other nature must be found and will be found for the others is very likely true, but when a body of men find that they are a picked lot and that it is very much to your advantage to have them on the job, they are also sure to get pretty cocky over it. Of course, you can raise their pay and still profit, and you will have the opportunity to do so pretty strongly set before you.

Until the experiment is tried in two stages, as suggested above, I, for one, shall question whether the same results could not have been obtained under the premium plan without all this alleged scientific study. There is a parallel case which, however, cannot be studied on Broadway, and that is the woodchopping business. This does not mean chopping kindling wood in the basement, but chopping in the woods. Here in New England everybody knows, of course, that this business is extinct and all the trees are cut down, but, in spite of what everybody knows, there are hundreds of men swinging axes in the woods within 10 miles of where I am writing. These men used to be Yankees, but they all got rich and retired or else got continuously drunk and did the same thing and their places have been taken by Italians, Canadians, and so on—certainly as tough a lot as ever broke pig iron.

These chaps come to town to the hardware store to buy their axes. Now if any young clerk thinks that all he has to do is to do up any old ax in a paper and make the right change he is mistaken. It is an hour's job to sell an ax. In the first place it has to be a certain shape, which shape is different for each man, and on which he cannot decide until he has "hefted" and squinted at every axe in the shop. Then the handle. Try to sell him a machine-turned handle and see. He wants a hand-shaved handle, the bottom one in your pile, no matter which is on the top, but that handle and that ax together just suit his build and his temperament and he knows what suits him and is just as careful in its selection as any ball player or any other high-salaried professional man is about the weapons of his profession.

These woodchoppers are paid by the cord or by the hundred railroad ties and so on. They want all the money they can get. Their season is short and they have no aversion to getting tired. The time they spend lighting their little short pipes is compensated by the time saved in keeping their noses from freezing. I would challenge Mr. Taylor, or anyone else, not even barring slide rules, to apply scientific principles and save a cent on labor.

Take Mr. Gilbreth's bricklayer. Is it the bricklayer's fault that he has not had all these advantages in the way of prearranged bricks, tables, etc? No, he is dependent on the contractor for these things. The supply of them is a legitimate part of the contractor's work and is in exactly the same line as the supplying of modern tools, jigs and fixtures in the shops. As for the motion study, I believe that individual bricklayers have sufficient intelligence so that, on straight work at least, if paid by the piece, they will evolve even quicker ways of doing work than Mr. Gilbreth can invent for them as a whole.

That seems to me to be the crux of the whole matter, that "scientific management," as taught by Taylor *et al.* neglects the individual temperament. It may assign different sizes of shovels to different sizes of men, but it forgets that there is something to men beyond hight and weight, that muscles may be strong but unless backed by the will power necessary to flex them, they count for less than those of a smaller and more hardy man. If anyone does not believe this let him study athletes. Here is scientic management carried to the extreme and yet none but the broadest classification can be made of successful physiques. It is not muscle, nor hight, nor weight that enables a man to perform great feats; it is that intangible control of muscle by the mind that makes a man run a hundred yards in 10 seconds, or that enables him to carry 47 tons of pig iron to a pile.

By the way, is it not better to spend all this energy in designing machinery to unload pig or in building shops by machinery out of concrete instead of clinging to our antiquated ideas of piling one little measly brick on top of another?

Springfield, Mass. ENTROPY.

Summer School of Engineering—University of Wisconsin

The eleventh annual session of the summer school of engineering, under direction of the college of engineering of the University of Wisconsin, opens June 26, continuing for six weeks. Regular and advanced courses are offered in direct and alternating currents, hydraulics, machine design, descriptive geometry, applied mechanics, shopwork, steam and gas engineering and surveying. Elementary courses adapted to the requirement of those not having preparation for the advanced work are offered in mechanical drawing, machine design and shopwork, in addition to which opportunity is offered for laboratory work in the electrical, steam and gas laboratories for those who have had power-plant experience or correspondence instruction.

This summer course has met with considerable success during recent years and further particulars concerning it can be obtained from Dean F. E. Turneaure.

Accident Prevention and Relief

Review of report of Ferd. C. Schwedtman and James A. Emery, forming a special committee of the National Association of Manufacturers. This is the most extensive study of the subject that has ever appeared in the English language, written with a direct bearing upon American conditions.

The findings of the committee state that a "sound policy of compensation" is a primary consideration.

In a book of 481 6x9 pages, with 131 illustrations in the text, many in color, are given the reports and recommendations of the special committee of the National Association of Manufacturers. It presents in concise form the result of a study that has cost the association upward of $30,000 and occupied the attention of a special committee for several months; for the investigation was carried out throughout all the principal industrial countries of Europe, with special attention to Germany and England. It is without question the most comprehensive and noteworthy book on its subject that has ever been printed in the English language. The material upon which it is based was obtained at first hand by the members of the committee. Many of the data, particularly from Germany, have never before been printed. The committee was in Berlin at the time of the twenty-fifth anniversary celebration of German accident-insurance system and was particularly favored through receiving information prepared especially for that occasion.

The work can be divided into four sections. The first seven chapters deal with the underlying principles of European compensation legislation, with a comprehensive presentation of the German policy, law and its operation. Chapters 8 to 13, inclusive, give a similar treatment of the English compensation acts, though with far fewer statistical data than are found in the preceding section.

Section 3 is contained in chapter 14 and gives the findings and recommendations of the committee. The last section is found in the appendix and comprises numerous letters from prominent German authorities, copies of the British workmen's compensation acts, and a description of numerous systems of voluntary relief in force in industrial plants in the United States. The index is unusually full and complete, covering as it does 52 pages.

It is evident that the German philosophy, as worked into fundamental law by Bismarck, and tested for 25 years in German industry, is sound and broad. It is acknowledged that its operation is a great blessing not only to the workers and employers, but to the industries themselves. In the industries a higher efficiency has been secured, due to an increased workers' efficiency, all this having been brought about by relieving the workers from the worry and distress incident to sickness, injury, superannuation and invalidity. Therefore, in this brief review the principles of the German act will be given, a few statistical data presented and the formal recommendation of the committee quoted.

The German system rests upon four principles:

1. It proceeds from the assumption that he who creates an enterprise, that peculiar structure of human beings, things and forces, and induces men to labor among arms of steel moving at high speed, establishes a source of danger and becomes responsible for damage resulting from this source. Under this theory *employers' fault need not be proved.* The fact that injury has been caused establishes claim for compensation.

2. Convinced that in many cases the resources of the individual employer would not prove equal to the enormously increased liability and that, therefore, the existence of the employer, as well as compensation of the injured worker would be jeopardized, *individual* responsibility is eliminated and in its place is put the *collective* responsibility of the industry.

3. To carry out this idea, large industries, and later on, commerce and crafts, or small industries, were organized into employers' associations, grouped according to callings. Thus legally incorporating, self-governing bodies were formed and each and every employer were *compelled by law* to join. The miller must join the millers' employers' association; the teamster, the employers' teaming association, etc. Upon these organizations was placed the responsibility of carrying and administering the accident compensation system, and to this end they were invested with far-reaching legal powers for enforcing their rules, for raising money, etc.

4. Accident prevention being of greater importance and larger social value than compensation, was also placed in the hands of these employers' associations, with the necessary legal authority for enforcement.

We observe that the first two principles define liability; the third is one of administration; while the last links the compensation and prevention of accidents. Germany is recognized as the great authority upon the development and application of these principles, and exercises a dominant influence in her study and application. No other nation in the world possesses data equally complete and extensive.

Turning to these statistics we are struck at once by the comparison of the number of individuals engaged in industrial and agricultural pursuits in the United States and Germany. The totals are very close together, being for the United States a trifle more than 29,000,000, and for Germany a trifle less than 27,000,000. This tends to show that the application of percentage figures from German statistics if applied to American industries would give results from which conclusions might be drawn with an assurance that they were on a sound basis. Among the German industrial population of the year 1908 1,008,677 workers received pensions to the amount of $39,500,000 for occupational injuries. The organization of this great work, the collection of the funds, the payment of pensions, and the administration of the entire system is in the hands of employers' associations. Bismarck coined the classical phrase "Freedom of organization, obligatory results." In different phrascology Germany virtually says to her employers: "Go ahead, you employers, get together! Elect your own officers, adopt your own rules and regulations, eliminate waste, friction and red tape. Get down to business and get results. The less waste you have, the fewer accidents you have, the less you will have to pay for insurance, and the less the nation will have to pay for compensation."

One effect of thus putting the responsibility upon the employer has been the development of devices for preventing accidents. This automatically reduces the amount that they must pay; in fact many associations have carried this work still farther and have voluntarily established dispensaries and hospitals and insist upon having injured employees treated free of charge. By employing specialists they ofttimes can save an injured limb, or bring about complete recovery from a serious accident; thus restoring the earning power of the patient and at the same time reducing the drain upon their insurance funds.

Perhaps the most striking of the many colored charts and diagrams are Figs. 26, 27 and 28, showing the proportions of va-

rious degrees of disability from occupational accidents plotted for various industries. Industries employing machinery or dynamic power are commonly looked upo1 as the most dangerous. Agriculture is not considered to have especial hazard, but from these charts we find in the year 1908 that 32½ per cent. of permanent and complete disability, 45 per cent. of partial permanent disability, and 45 per cent. of temporary disability occurred from occupational accidents in agriculture and horticulture. No stronger proof is needed to show that the farming industry must not be neglected in any legislation of this kind which is enacted in this country.

Other interesting charts show the frequency of industrial accidents according to days and hours. Monday and Saturday are the most hazardous days, and the period from 9 till 12 in the morning, and from 3 to 6 in the afternoon the most hazardous hours. The charts of frequency of accidents according to age and sex showed that the hazard increases very rapidly with age after the age of 25, this with reference to industrial workers.

Another series of charts shows the number of injured workers per 1000 insured workers for a number of leading industries. Still another series shows the insurance rate per $100 of pay roll and the number of injured workmen per 1000 insured workmen for leading industries. The accident-prevention feature is briefly touched upon by showing a number of safety devices. The recommendations of the committee follow:

Recommendations of the Committee

Your committee finds: That limited compensation for personal injury received in the course of employment is assured in the chief states of Europe and many of the British colonies. Such legislation, substantially, predicates:

That accidents, during work, frequently arise from unavoidable risks inherent in the nature and circumstances of modern production; that the economic consequences of such injuries should be borne primarily by the employment in which they occur and ultimately by society in whose service they are incurred and not entirely by the workmen to whom they occur; that this may be beneficially accomplished by transferring a limited charge for assurance against impairment of working capacity to society, as a cost of production, thus making certain the relief of the employee without unduly burdening the employer.

That the waste, delay and harmful bitterness engendered by litigating claims for personal injury in a legal system based upon fault as the sole ground of recovery justify and require that the state in the public interest make other equitable provision for the speedy adjustment of such controversies.

That *causes* of injury are to be anticipated and averted no less than *consequences*. Therefore, serious misconduct jeopardizing the life or limb of others or self-inflicted injury diminishes compensation or denies it.

That all employments are included save in exceptional instances where difficulties of application delay extension.

All European legislation embodying these ideas in variously qualified form, is neither framed with equal wisdom nor administered with like success. But the admirable enforcement of these principles in many states supplies conclusive evidence that rigidly applied they are socially, economically and industrially advantageous, and if adapted to our form of government, mode of thought and conditions of labor, would confer undoubted benefit.

Accident Prevention and Medical Aid

That the advantages perceived were secured and are maintained only in accompaniment with a sound, vigorous and scientific system of accident prevention, obtaining public and private coöperation, with suitable provision in all cases of personal injury for prompt and efficient first-aid treatment provided by the employer, and of which the injured person may be required to avail himself under penalty of losing or diminishing subsequent compensation.

Investigation Essential to Legislation

The sound compensation laws rest upon a solid foundation of fact obtained through the deliberate and impartial investigations of trained men, and, in the opinion of recognized European authorities, require for successful administration the continuous collection and compilation of statistics relating to every circumstance of accidents and their compensation, and the progressive application of such ascertained experience.

High Value of German Statistics and Experience

That the German empire, which first applied the principle of assured compensation, is, among all the countries of Europe, the most practically successful in its application; that it alone compiles, possesses and has continuously applied the record of its experience to the development of a scientific system of accident prevention and compensation. That its accumulated statistics and tested methods are of compelling influence on the legislation of Europe. That its conditions of employment and ratio of agricultural to indus'rial workers, its progressive application of mechanical forces to new employments, make its methods and information a profitable study for ourselves. That while many details of its administration are neither applicable nor desirable, the chief principles of the German system of accident compensation may be adopted in our respective States by voluntary action or through permissive legislation and, in a large degree compelled by statute.

A Solvent Insurance Fund Preferable to Individual Liability

That assurance against loss of working capacity is the basis of all European systems of compensation, avowedly in most systems, logically in all others, declared in German legislation, implied in English legislation. That each European system fails in the practical execution of its theory in the proportion that it rests compensation of injury upon personal liability and not upon contribution to a solvent insurance fund from which awards are paid. That if every employer becomes a limited insurer in law, he should become an insurer in fact, and the obligation of contributing to a compensation fund or providing an acceptable form of insurance should become a substitute for personal liability. That contribution to a common fund, in accordance with the ascertained hazard of the employment, assures compensation and makes it a definite charge. That mere increase of personal liability with optional insurance enlarges the burden of the great employer, with no assurance of recovery from the small one. That the creation of a compensation fund administered by the contributors or the state, but preferably the former, permits provision for simple, cheap and rapidly moving machinery in the adjustment of claims, eliminates the bitter antagonism and social friction arising from opposing interest inseparable from personal liability, covers hard cases without excessive cost, allows undue or inequitable burden a higher rate of disability and death benefits and permits the calculation of a fixed annual charge for legal risk capable of decrease by accident prevention.

Methods of Insurance

We find that limited compensation through insurance is successfully obtained; through the creation of a fund administered by the state, to which employer and employee contribute and from which compensation is paid; or through a fund supervised by the state to which employer and employee contribute and in the administration of which they are represented in proportion to their contribution; or through voluntary mutual associations, either of employers alone or of employers and employees, organized under permissive legislation; or in private insurance associations in which the employer may carry his risk in those nations where compensation is assured by the extension of personal liability.

That the most efficient, economic and progressive insurance system is one in which an intimate relationship is estab-

lished and maintained between shop management, insurance management and the supervision of accident prevention, and in which rates can and will most closely conform to the accident record of the individual employer.

Contribution by Employees

We believe those systems more equitable and expedient which require minor contributions from employees. They alone provide a justly proportionate distribution of the pecuniary burden, assured dual interest in the discouragement of fraudulent claims and mutual coöperation in the practical prevention of accidents, for which employer and employee are jointly responsible. They provide a necessary protection against the contamination of those qualities of thrift and self-reliance, which have ever been regarded as among the most valuable assets of American character.

Single Liability Essential

We find compensatory legislation is intended to exclude or purposely endeavors to discourage, save in exceptional cases, the use of pre-existing remedies at law. The creation of a single liability or a single obligation to contribute to a compensating fund, is the purpose and evident tendency of all foreign legislation. A single liability is essential to the satisfactory operation of the compensatory principle and its adoption should therefore be accompanied by the repeal, as far as possible, of all other remedies.

Compensation Principle Should Apply to All Employments

We find in the complete statistical record of the German empire covering a period of 25 years and sustained by the less complete returns of other European countries and the relative rates of private insurance therein, that we must readjust our conventional notions of the comparative hazard of various employments. European and Canadian (a) official statistics and the comparative personal accident rates of American insurance companies all indicate a high percentage of accidents in agricultural as well as industrial pursuits. If, therefore, any employer is to become an insurer against accident in employment, all employers should bear the same burden in proportion to the actual hazard of their particular pursuit. We find that the application of the principle of compensation should be universal, or it places unequal and arbitrary burdens upon classes of employers and denies participation in the benefits of its remedial provisions to vast classes of employees.

Limitations of Compensation and Medical First Aid

We find that the amount of compensation required under the various European systems is not regarded as a complete indemnity but as a substantial expression of the impairment of earning capacity. That in the better system it is neither allowed nor intended to recompense trivial injuries nor breed paupers by corrupting thrift. That to this end a reasonable waiting period is established between the reception of injury and the allowance of compensation; that such precaution alone provides efficient defense against the conscious or unconscious exaggeration of slight injury and safeguards self-reliance. We find further, however, that during such waiting period, from the moment he has notice of accident, the employer should provide first aid and necessary medical attendance, thus preventing trivial injuries from becoming serious disabilities through ignorance or neglect.

We find that as an essential feature of administration, all European systems provide for cheap and expeditious adjustment of claims. That employer and employee are encouraged to reach an agreement. That in the event of a dispute as to the facts or application of the law, resort is had to arbitration, the finding of the arbitrators on questions of fact being final and appeal permitted only on questions of law. We believe similar provisions advisable, practicable and attainable through the agency of contract and the creation of arbitrators, by conferring powers of arbitration upon our judges or persons chosen by the disputants, subject to ultimate rights of action which are likely to be exercised or remain dormant in accordance with the practical operation of such preliminary aids to agreement.

We feel called upon to emphasize that any application of the compensatory principle in our own country requires assurance of substantially uniform legislation by the States of the Union. The establishment of a variety of systems differing in form and substance and creating new liabilities varying in nature and degree, would produce conditions too obviously harmful to require amplification.

A Sound Policy of Compensation

We are conscious that the introduction of principles implying systematic compensation for accidents of employment into our form of government bristles with legal difficulties. We are not here concerned with their consideration or discussion; we are primarily interested in the selection of a sound policy. We believe, however, that at the present time and during the period of investigation which must necessarily precede the adoption of a satisfactory system, voluntary action by private employers should receive public encouragement. While our legislatures are engaged in deliberating over the wisest method of exercising their powers of compulsion, splendid forces may be set in operation if they will give attention to their opportunities for persuasion. Pending the formulation of a public system, the voluntary adoption of equitable schemes can be expedited by lessening the liabilities of employers who guarantee just compensation as well as by threatening the legal defenses of employers who do not.

We therefore conclude from the better results of European experience that for reasons of justice, economy and well-being we ought to endeavor to substitute for a system in which redress for injuries received in employment rests upon established fault, one in which limited compensation is assured for all such injuries, by methods making possible such broad distribution of the burden as will rest no harmful weight upon individuals, and protect and encourage the careful employer. We believe assured limited compensation for work injuries to be a desirable and necessary end, to be successfully executed through a method of insurance clearly providing an equitable, certain and definite distribution of risk.

No scheme can be complete or satisfactory which does not inseparably associate prevention with compensation, authorizing intelligent and impartial state and private inspection, arousing public interest and directing the public mind to the importance of averting accident, an object to be attained through municipal and state museums of safety appliance and the continuous compilation and publication of accident statistics.

Final Summary

Successful legislative action throughout Europe has been preceded by deliberate and painstaking investigation, extending in many instances through years of effort in the collection and comparison of information. We are fortunately able to avail ourselves of the most practical features of the Old World's labor and experience. But we should make a start for ourselves here and now, providing at once for the accumulation in our respective states of that accurate information which is a basic necessity for intelligent action. Having once determined upon a rational policy of compensation, we believe rapid progress can be made in giving it appropriate legal form and adapting it to our customs and institutions. We should act now and as rapidly as is compatible with the greatness and complexity of the subject and its intimate relation to the prosperity of the employers and workmen of our country.

We do not believe we can draw our decisions to a close more fittingly than by quoting from an English official source a statement that at once epitomizes our problem and contains a final word of admonition:

"Whatever may be the true view as to the incidence of the burden of compensation for accidents, it seems plain that if the cost thrown, at all events in the first instance, on the employer is exces-

sive, the ultimate loss consequent thereon will fall with equal or greater weight upon the workman either by diminution of wages or loss of employment, or loss through the insolvency of the employer. The problem, therefore, is to attempt such an adjustment of the burden as will enable the great industries of the country to be carried on without an excessive share of the losses occasioned by industrial accidents being thrown either on the employer or the employed."

Meeting of Mechanical Engineers

The regular monthly meeting of the American Society of Mechanical Engineers, held on May 10, was devoted to a discussion of patents, more particularly from the engineering side. Four papers were presented.

D. Howard Haywood discussed the rights granted by patents for inventions and the protection afforded. Under the wording of a patent the patentee has the exclusive right to make, use and vend for a specified term of years, the invention claimed therein. These words taken in an ordinary meaning would seem to grant to the owner the right to make, use and vend the invention, coupled with the right to exclude others from so doing. But this, so very commonly accepted meaning, is not their meaning at all. Letters patent grant no right to make, use or vend an invention, but only the right to prevent others from doing so. The so-called exclusive right is merely the right of exclusion. If the grantee has the right to make, use and sell the invention at the same time he receives the patent, then the patent grant makes that right an exclusive one; but if he does not have that right at such time, the patent does not give him such right, but merely the right to exclude others therefrom.

Patent Rights Transferrable in Whole or in Part

"There are, in general, three ways of transferring patent rights, in whole or in part, to another: (a) by assignment; (b) by territorial grant; (c) by license. If an entire right is transferred, the assignee is merely substituted for the original grantee, and assumes every right the original grantee had at the time he made the assignment. If, on the other hand, the assignment conveys from the grantee to an assignee in terms a part only of the right granted to the patent, the situation is not nearly so clear, and in fact is very commonly misunderstood.

"Too much stress cannot be laid on the fact that in a naked assignment, that is one unaccompanied by any restrictions as to partnership agreement, it matters not one iota what proportion of the patent right is nominally assigned. An assignment of a one-hundredth part conveys exactly the same right in this respect as one-half or ninety-nine hundredths. Any undivided part gives complete right, subject only to similar right in the other, and the owner by assignment of any fractional part, no matter how small, may break up his part into as many smaller parts, theoretically to infinity, as he may desire, and may assign these parts to an infinite number of people.

"I am particularly desirous of warning inventors not to assign fractional parts of their patent rights unless unaccompanied with a partnership agreement, and preferably with an understanding that no further right shall be granted without the signature of all the owners; then, and then only, are the parties protected. In any other case an owner of any part of the patent may proceed independently of the other, or others, and may grant other rights indefinitely. This situation is little understood and scarcely ever appreciated, other than by lawyers trained in patent matters; yet it is of paramount importance that it be understood. There is, so far as I know, no parallel in the law thereto. There is no analogy in this respect between the construction of patent assignments and those relating to tangible properties, such as real estate, or goods and chattels, yet most people act upon the assumption that there is, and so valuable rights are lost or jeopardized."

In summing up, Mr. Haywood gave the following warnings to inventors and those interested in inventions:

A. Not to take it for granted that the possession of a patent entitles the patentee to make, use or sell the invention protected thereby.

B. Not to assign undivided portions of a patent right unless such assignment be accompanied with a partnership agreement, and preferably with an agreement providing that no further rights be granted, or assignments given, except over the signatures of all of the owners of the patent.

C. To see that the claims in their patents adequately and properly cover the invention.

D. Do not permit any publications of the invention to take place prior to the application for foreign patent where foreign patents are to be obtained.

The Patent Expert

The position and functions of the patent expert were presented in a paper by E. W. Marshall. By way of definition he said: " An expert [patent expert] is a man instructed by experience and professional conversant with the science or practice in question. He must possess such peculiar knowledge and skill attained by previous habit or study as to make him more capable of forming a correct judgment upon a subject matter than an inexperienced person." In our present system of patent litigation, an important part is played by patent experts, or more properly styled, professional expert witnesses. Many engineers are often called upon from time to time to give testimony of this nature. The weight and value of their testimony and opinions in aiding a court to reach its decision have thus been expressed in principle by Judge Hawley: "The opinion of an expert is, in certain cases, admissible as evidence, but it is not conclusive upon the courts. It is to be considered as a judgment and opinion of a man who has had extensive practice, education and knowledge in relation to the particular subject upon which his testimony is given. If the reasons given by the expert witness are deemed reasonable and satisfactory, the court may adopt them, but if they are unsatisfactory the court will discard the testimony and act upon its own knowledge and judgment."

Mr. Marshall stated that obviously patent experts are partizans, but that this does not mean that they are prejudiced men, incapable of fair judgment.

In discussing the theory upon which patents are granted, Mr. Marshall presented the following: "A better theory of letters patent would be that they should be considered as of the nature of public franchises granted to the inventor for the purpose of accelerating the wheels of progress. Under this theory a patent to be valid would have to be used by its owner if there were any public demand for it. Patents are not to be regarded as monopolies, created by the executive authority at the expense and to the prejudice of the community, but rather as rights, given as a matter of compensation to the inventors for their labor, toil and outlay in making the inventions and reducing them to practice, and disclosing them for the public benefit.

"The development of an invention is of as much importance to the public as is its creation. Without some legal protection it is impossible to interest capital, or to obtain assistance from others to reduce the invention to a useful commercial proposition. So, by granting patent protection the rights of the public are not held in abeyance during the term of its life, but the public is benefited from the beginning."

The two other papers were: "The More Fundamental Principles of Patent Law," by Edwin J. Prindle, and "Rights of Employer and Employees in Inventions," by A. Parker Smith. Of these the latter is a most valuable presentation of the law and court decisions on the subject, and will be given in full in a future issue.

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American Machinist

Miller-Grinder-Driller

We have pointed out in these columns some of the confusion and inconsistencies that exist in the use of the names of machinists' tools and machine tools. The example that will come first to the mind of everyone is the word "drill," which is used for both the cutting tool and the machine that drives it. To do away with this particular conflict, the word "driller" has been applied to the machine to distinguish it from the cutting tool, the drill. While its use is much less common than that of "drill" or "drilling machine," it is a good and justifiable technical term.

The term "miller" instead of "milling machine" and "grinder" instead of "grinding machine" are similar examples.

There seems to us to be no good reason why these terms should not be generally used. The two governing reasons are clearness and economy. It takes less time and effort to speak, write or read "driller" than "drilling machine," "grinder" than "grinding machine" and "miller" than "milling machine," and the use of explanatory words is as easy and simple in one case as in the other. To start the ball rolling and make our own work agree with our belief, hereafter in the reading pages of the AMERICAN MACHINIST the terms "miller," "grinder" and "driller" will be used.

Value of Trade Marks in China

One of our major articles in this issue deals with the Chinese machinery trade. It is written by an American engineer who has spent six years in the Orient selling American small tools. Thus he has a first-hand knowledge, both of American manufacturing conditions and Oriental markets. One of the important points brought out is the value of trade marks or "chops."

By way of added emphasis we call attention to the paragraphs dealing with the worth, in fact necessity, of trade marks or "chops" in Oriental countries. Any manufacturer intending to build up a Far East export trade should select a suitable and distinctive trade mark. Many such, which are the most successful, represent some well known thing which has a definite name in the vernacular. Thus, the hand and the eagle are two well known "chops" on small tools.

The position of the United States in regard to Oriental trade is far from one to give us gratification; our share, 6½ per cent., is not a very great proportion, nor is the corresponding total, $230,000, a large amount. From many sources we are hearing of the awakening of China. This will mean an increased purchasing of manufactured products. The American manufacturers of machinery should reach out and get their share. But before they do so, it would be wise for them to adopt a suitable "chop."

Why Is It Difficult to Make Simple Designs

Why is it difficult to design simple mechanism? Why is it easy to pile device upon device in working out a mechanical solution of a given problem? Why does a really simple, serviceable device often seem "perfectly obvious" to the non-technical man, although it may have taken hours and weeks to think out and perfect?

Some machines are complicated because they have been a growth. Improvements and attachments have been added by various persons until unnecessary complication exists. It is finally a piecemeal design instead of a consistent one. For example, a certain shoe-sewing machine had undergone such a development and was covered with attachments and additions to the original design. A skilful shoe operator once demonstrated that he could take off 40 per cent. of the parts of one of these machines and still successfully sew shoes.

Thus lack of a unified design tends to complicate mechanism.

But oftentimes a design is worked out entire by a skilful designer and proves to be complicated when compared with a later development for the same work. It may be that the second was suggested by the first. But whether this is true or not, why did not a process of analysis bring about the second result instead of stopping at the intermediate stage of the first device?

A lack of thoroughness and insufficient time may be urged as possible reasons, but the real answer is deeper. It is "because the thinking was not clear and logical." A study of machine design should be much more than learning how to proportion parts, compute stresses and strengths and analyze the functioning of the elements of mechanism. It should provide the student and designer with means to determine whether or not a device has been reduced to its lowest terms, and if not, point the way to that solution.

For, after all, it is difficult to design simply, because it is difficult to think clearly and surely.

High Wages and Low Cost of Production

All the efficiency engineers, without regard to race, color or previous conditions of success or failure, recognize the common error of riveting the eye on the pay roll instead of on the cost of production, and are making this one of their foundation stones. If all their underpinning was as sound as this, we should have little to fear as to results.

It is a very common mistake to consider wages as the only important factor in counting the cost of production; for, while they must be carefully considered, it has been proved in many cases that a high-priced man is often the cheapest man to hire.

Much as we may differ from some of the methods advocated by those who are just now in the limelight, we commend them freely for the good work they are doing in calling attention to this particular point.

Accuracy in Stating Time

With our modern shop systems the making of records becomes a part of the duties of many members of a shop organization. Not a few of these records must bear not only dates, but the time of day. It is very easy for us to look upon the indicating of the hour as a perfunctory duty and say to ourselves, "Oh, any time within half an hour is close enough." As a fact, this position may have some truth, but as a habit for the individual it is far from wise. Accuracy is of the utmost value. It is said that writing makes an exact man. If, therefore, we are slipshod in what we write, the value of writing itself as mental training in exactness is lost.

Therefore, let us exercise more care in the accuracy with which we time written memoranda, providing such time is required.

Trade School Textbooks

It has recently been pointed out that there is need of text books written with particular adaptation to trade schools. The need is apparent, but some of the difficulties in their preparation are not so.

It is easy to plan a text book for school or college mathematics, for a language, or for any other general school subject, because years of experience have demonstrated the general lines that are the best ones to follow in such teaching.

In the trade school the situation is entirely different. There are but few of them, none have been running for more than a few years, their general schemes of organization differ, to say nothing of what they teach and how they teach it, and there is no accumulated history or experience pointing out the best way to teach trade-school mathematics, mechanical drawing, business forms, shop practice, or any of the other subjects that are being taught in trade schools.

We need trade-school textbooks and need them badly, and we need yet more a demonstrated theory of teaching upon which such books can be founded.

Lubrication and Depreciation

If you examine a second-hand machine tool with the purpose of buying, what is the first point that you look over? Probably, the bearings. Why? Because they show more quickly and surely than any other vital place the care or abuse that the tool has received.

To an extent the depreciation of the tool is in inverse ratio to the lubrication it has received.

This is a money-making reason for better lubrication of machinery.

Personals

Reuben Hill, formerly factory manager of the Bristol Engineering Corporation, Bristol, Conn., has become superintendent of the Detroit Lubricator Company, Detroit, Mich.

John S. Nicholl, late of the New York Edison Company, and formerly acting manager for F. W. Horne, machinery importer of Yokohama, Japan, has joined the staff of Walter B. Snow, publicity engineer, Boston, Mass.

Willard E. Lape, who has been with W. D. Garrett & Co., New York City, has joined the mechanical engineering staff of W. M. Sheehan & Co., of the same city, and will look after power-plant design and construction.

Wolcott Remington, designer and manufacturer of oil engines, has associated himself with the Blanchard Machine Company, Cambridge, Mass. He is now engaged in getting out for them a line of stationary and marine oil engines.

J. H. Maysilles, until recently general foreman of the electric locomotive and truck department of the American Locomotive Company, Schenectady, N. Y., has become superintendent of the Davenport Locomotive Works, Davenport, Iowa.

T. L. Ferrall, for the past 14 years superintendent of the Rowe Manufacturing Company, has severed his connection with that company and is now identified with A. R. Pritchard in the management of the Pritchard Stamping Company, Rochester, N. Y.

C. E. Hardy, who has been assistant shop superintendent of the manufacturing department of the Mare Island Navy Yard, has become associated with the Westinghouse Electric and Manufacturing Company's San Francisco office, to act in the capacity of industrial engineer.

W. M. White, for the past five years chief engineer of the hydraulic department, I. P. Morris Company, Philadelphia, Penn., has become associated with Allis-Chalmers Company. Mr. White will act in the capacity of manager and chief engineer of the hydraulic turbine department.

Rollin W. Hutchinson, Jr., who was for a long time associated with the Westinghouse interests, but in recent years has been connected with the automobile industry as advertising and publicity manager for several of the leading pleasure car makers, has been appointed advertising and publicity manager of the Saurer Motor Company, New York City, which was recently formed to manufacture the Saurer motor truck at Plainfield, N. J.

Obituary

Milton Buckley, president of Henshaw, Buckley & Co., machinery dealers, San Francisco and Los Angeles, Cal., died at East Oakland on May 1, age 51. Mr. Buckley was a mechanical engineer and founded the house which bears his name in 1890.

Frank S. Jackman, who has been connected with the steel industry for some 40 years, died on May 5. Mr. Jackman held important positions with several steel companies, and at the time of his death was general manager of the Standard Steel Car Company's Verona plant.

New England Foundrymen's Meeting

The regular monthly meeting of the New England Foundrymen's Association was held at the Hotel Worthy, Springfield, Mass., on the evening of May 10, with an attendance of over 90 members and guests.

The technical paper of the evening was presented by Wilfred Lewis on "The Molding Machine." By a number of lantern slides the development of the molding machines was briefly traced from the beginning; important patents were pointed out and many molding-machine installations shown, with records of output in number of flasks per day.

Mr. Lewis made a strong plea for an improvement in the management of foundries. By means of two tables he showed a detailed time study of the same job when molded, first by hand and second by machine. The time has been accurately taken by means of a stop watch and was figured to the hundredth part of a minute. From a study of such analyses it is possible to determine where saving can be made in machine molding as compared with hand molding.

Mr. Lewis said in substance that there is probably no other machine-shop department where such improvement and economies can be made by the introduction of scientific management as can be made in the foundry.

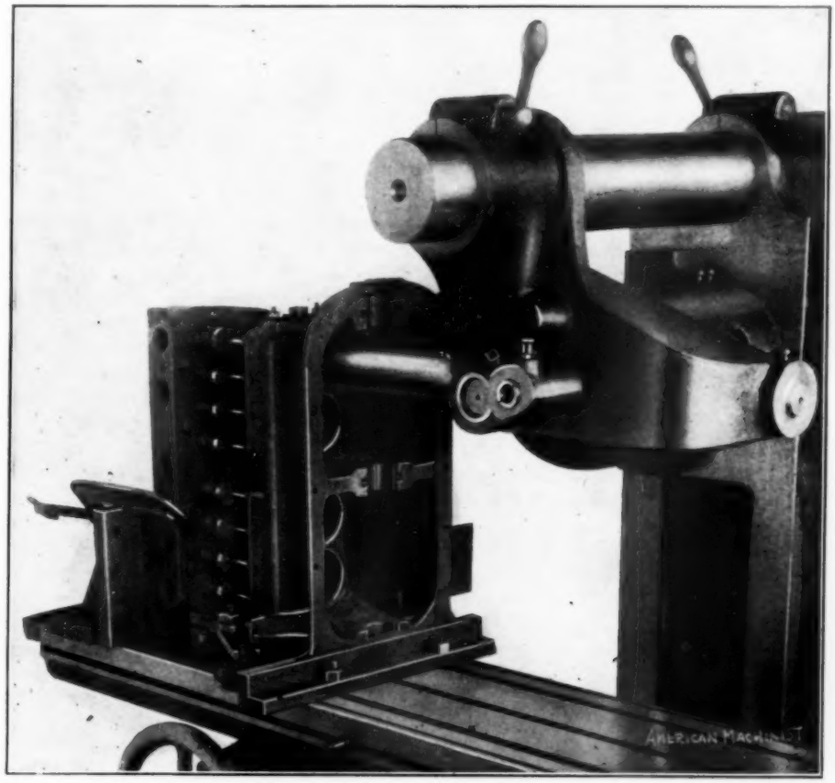
Shop Equipment News

ANY and all new or improved machines, tools or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here — the machine shop news.
A more full and detailed description will be given — when it is real news — if it can appear here first — before it is sent to other papers. ALL descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German

Cylinder Boring and Reaming Attachment

The halftone shows an automobile boring, reaming and lapping attachment which has been brought out by the Garvin Machine Company, New York. It is applied to their No. 15 plain miller, which has a table 64 inches long by 12 inches wide. For reboring cylinders *en-bloc* they may be mounted as shown or strapped to a special angle plate.

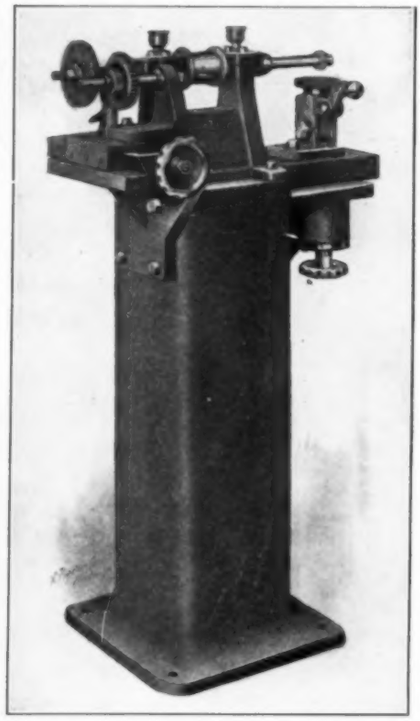
An adjustable boring head, having three boring tools, is mounted on the special horizontal head that is solidly bolted to the face of the miller and clamped to the steel arm. This boring head has a projecting spindle that is threaded on the forward end to receive the adjustable boring tool and the spring adjustable lapping tool. The regular feed of the table is used, with automatic stop trips. After the boring operation the lapping tool follows. This lapping tool is made in four sections of material that will allow of emery cloth being secured to it. A two-speed countershaft gives the necessary high-speed for this lapping operation, although in many cases the boring operation gives a satisfactorily finished surface. The reverse feed to the machine allows the lap to travel under power feed in both directions with automatic stop trips. The adjustment of the knee gives all that is required to locate for the consecutive cylinder holes. The attachment is readily applied or removed.



CYLINDER BORING AND REAMING ATTACHMENT

Straight and Spiral Cutter and Mill Grinder

This machine is designed especially for grinding side and face cutters with a capacity of 4 inches by 2½ inches. It is arranged with an adjustable rest which is connected with the slide which holds the cutter while being ground. Bushings are used to hold thin cutters while grinding which slide freely on the stud which is fed across the wheel by hand. The slide has an adustable stop on the rear end to regulate the amount of grinding. It is arranged with a square-thread feed screw, and the slide is gibbed to take up the wear. The face grinding attachment can be tilted to any desired angle and is arranged with an adjustable stop on the slide. The mill is held in position by a plunger which is held with a spring that locks into the teeth of the mill, holding it perfectly rigid while grinding.



STRAIGHT AND SPIRAL CUTTER AND MILL GRINDER

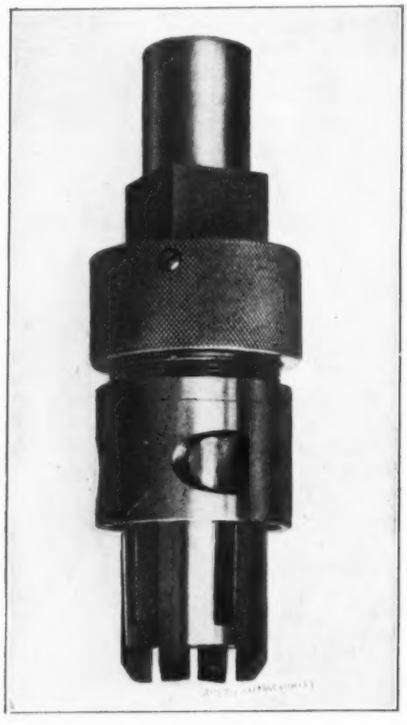
The spindle is made of crucible steel, and the bearings measure 3 inches by ¼

inch with take-up collars. The pulley is arranged with a 2-inch belt. The machine weighs 225 pounds and is a recent product of the Northhampton Emery Wheel Company, Leeds, Mass.

Collapsible Tap

The collapsible tap illustrated in the accompanying halftone has recently been perfected by F. W. White, superintendent of the William H. Page Boiler Company, Meadville, Penn.

The tap has no projecting levers or trips, and the chasers, positive in action, are not actuated by springs. To open the tap by hand when running it is only necessary to grasp the nurled collar and

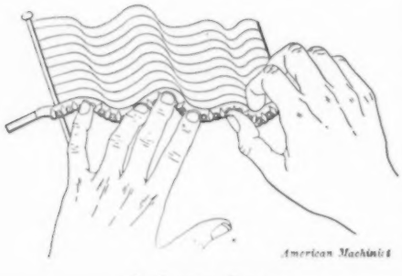


COLLAPSIBLE TAP

hold it for an instant. The depth gage is adjustable and is held by a check collar. When used in an automatic machine the action of the tap is entirely automatic.

Curve Rule

The illustration herewith shows a rule designed especially for drawing irregular curves of all descriptions, and its utility in drawing ellipses, parabolas, hyperbolas, gear teeth, screw threads, etc., is apparent. It is easily adjustable to form which it retains until changed by the operator, which makes it useful for templet work, drawing of involute curves, etc.



A CURVE RULE

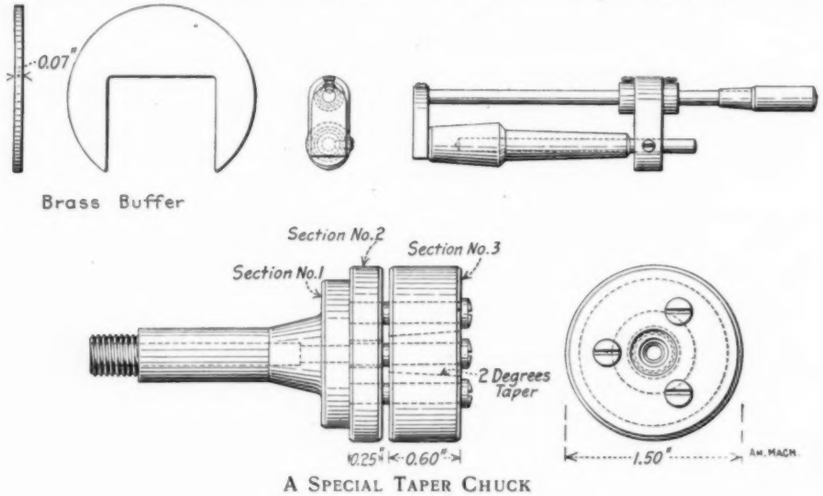
These instruments are made in 3-, 4½-, 7-, 9- and 18-inch lengths by the Designers Rule Company, Chicago, Ill.

A Special Taper Chuck

BY GUS HAESSLER

The large number of small tools and machine parts entering the manufacture of a watch calls for considerable ingenuity in devising methods for producing them to the required degree of accuracy conveniently. An instance of this is shown in the accompanying cut. This gage and chuck were made for insuring uniformity of thickness from the bottom of the hole to the end face of a lot of screw die blanks, one of which is outlined in the gage shown.

To make all the dimensions of these blocks exactly alike would require close attention, as they are driven in taper chucks, and a difference of 0.001 inch in the diameters causes the blanks to enter the chuck nearly 0.015 inch. This bars the use of the regular taper chuck, for assuming that there is a variation of 0.002 inch in the diameter of the blanks, this would result in a variation of 0.03 inch in the required thickness, when drilling to a stop.



A SPECIAL TAPER CHUCK

The special taper chuck shown eliminates the variation that would result from using the regular chuck, which will be seen presently. Sections 2 and 3 were made of tool steel. A 0.22-inch hole was first drilled and reamed in the center of each, facing one side at the same chucking. The other side was faced parallel with it on a facing chuck. A pin was then slipped into the holes while the sections were clamped together, and soldered at three points at the joint. The sections were now chucked in a 1.50-inch spring chuck while being spotted for the three holes; indexing and using the milling attachment. They were then removed from the chuck and clamped to the drill pad while drilled, then reamed to 0.1975 inch. The stud was next turned on the first section as indicated, and the shoulder faced off so that section 2 could be slipped onto it.

After tapping the first section and counterboring the second, three pieces of No. 7 wire were cut off and tapped at one end for screws, the heads of which are shown in profile; these screws prevent section 3 from being driven off when ejecting the work. The other ends of the wire were driven into section 2, after the projecting portion was buffed off to a push fit into the holes in the section 3. The second section was now slipped onto its stud and secured with the screws, when section 3 was pushed onto the three pins, then bored so that the smallest blank was extended through from the inner face about 0.03 inch when driven in.

The brass buffer was slid into the space between the sections while driving, and after removing it a slight push on the third section carrying the blank was sufficient to bring the end in contact with the face of section 2, thus securing an invariable working point. All of the blanks were first drilled shallow in the regular chuck, leaving from 0.05 to 0.08 inch to drill in the special chuck. By setting the drill to a stop, and measuring with the gage occasionally, it was an easy matter to get these blanks practically alike. The gage was set to a 0.25 inch standard pin, passing it between the end of the lower wire and the inner face of the end stop, securing it by means of the set screws in the small collars. The nurled thimble serves to turn the end stop up out of the way when the work is placed on the wire for measurement. All holes in the gage except screw holes were reamed. About one-half inch in the middle of the upper wire was left soft, the remainder being hardened; no grinding or lapping was done on it, and it was made entirely of odds and ends picked up at random.

Increasing Shop Capacities

News items for the sales department — where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip — facts

Metal Working

NEW ENGLAND

The American Voting Machine Company, Boston, Mass., will buy bench lathe.

The Winchester Repeating Arms Company, of New Haven, Conn., will enlarge its plant.

National Pipe Bending Company, of New Haven, Conn., will build an addition to its plant.

The American Wringer Company, of Woonsocket, R. I., contemplates erecting a new factory.

G. W. Bradley Sons' ax factory at Weston, Conn., was destroyed by fire. Loss about $30,000.

The Royal Typewriter Company has awarded contract for building new factory at Hartford, Conn.

The Stanley Works, at New Britain, Conn., making builders' hardware, was damaged by fire to the extent of $50,000.

Fay & Scott, Dexter, Me., lathe builders, are adding about 11,000 feet of floor space to their plant. State no new equipment will be needed.

The United States Aëronautic Company, a $100,000 corporation, has been organized and will erect a plant at New Haven, Conn., for building airships.

The Moncrieff Manufacturing Company has purchased a building on Sheriden street, Central Falls, R. I., where it will conduct a machine business.

The plant of the Wire Fabric Company, Norfolk Downs, Mass., was badly damaged by fire. Loss, $10,000. Mayor William P. Shea, of Quincy, Mass., is principal owner.

The Hainer Bookkeeping Machine Company, Providence, R. I., has been incorporated with $60,000 capital to manufacture machines for bookkeeping. Incorporators, Wm. H. Waite, W. E. Waite, W. S. Henry, etc.

The New Britain (Conn.) Machine Company, which purchased the plant of George G. Prentice & Co., of New Haven, building turret machines, is erecting an addition to accommodate the new business.

MIDDLE STATES

Universal Auto Truck Company, Youngstown, Ohio, will erect a plant.

The Olive Machine Company, Ironton, Ohio, will erect an additional building.

A foundry will be built by the Atlantic Foundry Company, at Akron, Ohio.

Roundhouse will be built at Conneaut, Ohio, by the Nickel Plate Railroad.

Champion Steel Range Company, Cleveland, Ohio, is building a three-story addition.

The National Tool Company, Cleveland, Ohio, has purchased site for a new plant.

The Minster Machine Company, Minster, Ohio, will build an addition to its plant.

The American Radiator Company, of New York, will build a plant in Bayonne, N. J.

W. N. Frew will build a garage on Fifth avenue, near Shady avenue, Pittsburg, Penn.

The Star Foundry Company, Albert Lea, Minn., is erecting a new foundry at North Waterloo.

The Crane Valve Company, Bridgeport, Conn., has let the contract for a heavy machine shop.

Parish & Bingham Company, Cleveland, Ohio, metal stampings, etc., will add to its present plant.

P. McGarrigle is having a garage built at Germantown avenue and Coulter street, Philadelphia, Penn.

G. W. Ralph is having a two-story garage built at Nineteenth and Norris streets, Philadelphia, Penn.

The Nicola Land Company will build a garage on Louisa street, Pittsburg, Penn., to cost $25,000.

Fire destroyed the machine shop and pattern shop of Theo. Smith & Sons Company, Jersey City, N. J.

C. D. Wedge, Howard Fulkerson and J. G. F. Holston, Zanesville, Ohio, will equip a commercial garage.

The Belmont Stamping and Enameling Company, New Philadelphia, Ohio, will erect an addition to its plant.

The Excelsior Foundry Company, Bay City, Mich., whose plant recently burned, will rebuild on a larger scale.

The plant of the Washington (Penn.) Tin Plate Company is to be rebuilt. The new plant will have six hot mills.

A permit has been issued to E. F. Guthrie to build a stone garage at Forbes and Denniston avenues, Pittsburg, Penn.

The Western Kiele Steam Specialty Company, Chicago, Ill., will erect a new plant on West Illinois street near Clark.

A permit has been issued to William J. Gallagher to build a garage on Broad street, near Pike street, Philadelphia, Penn.

Johnson Coin Lock Company, Columbus, Ohio, has been incorporated for $25,000 by M. M. Huffman to manufacture locks.

The Stevenson Engineering Company, 29 Broadway, New York, has plans prepared for a machine shop at Tottenville, S. I.

The Suspension Ball Bearing Company, Sandusky, Ohio, will erect a new plant. Is in the market for modern machinery.

The Parish & Bingham Company, of Cleveland, Ohio, manufacturer of metal stampings, is erecting an addition to its factory.

The Packard Motor Car Company, of Detroit, Mich., will erect a factory building to be used in the manufacture of auto trucks.

Estimates are being prepared for a building at 1613 Carpenter street, Philadelphia, Penn., for the Southwark Plating Company.

A garage will be built for the Lehigh Realty Company at the corner of Chambers avenue and Somerset street, Philadelphia, Penn.

Fire destroyed the machine shop of E. R. Draver, Richmond, Ind., on the night of May 2. Machinery was damaged to the value of $4000.

The Frank Prox Company, Terre Haute, Ind., manufacturing steam and hot-water boilers, heaters, etc., is erecting a two-story addition.

A garage is being erected for H. H. Patterson on Beechwood boulevard, between Northumberland and Wilkins avenues, Pittsburg, Penn.

The Simplex Bolt and Nut Company, Detroit, Mich., has been incorporated with $10,000 capital by Frank H. Kimball, Edward Barrett, etc.

At Alliance, Ohio, an additional plant is to be built by the American Steel Foundries Company on land recently purchased near the present plant.

The Edison plant of the Philadelphia (Penn.) Electric Company, on Sansom street, above Ninth, was damaged by fire and water. Loss about $25,000.

The Everhart-Delaney Company, Oshkosh, Wis., capitalized at $150,000, has commenced the erection of a building for the manufacture of drop forgings.

Baugh & Son, manufacturers of chemicals and fertilizers, are having a garage built at Delaware avenue and Moore street, Philadelphia, to cost $13,500.

The Westinghouse Electric and Manufacturing Company, Pittsburg, Penn., has plans completed for a new four-story building to be used as a pattern shop.

The Cleveland Auto Spring Company, Cleveland, Ohio, has been incorporated for $15,000 to manufacture automobile springs by H. E. Ehlet, J. A. Flajole, etc.

Estimates are being prepared for a factory, storage building and warehouse for H. B. Pancoast & Co., at Front and Ellen streets, Philadelphia, Penn., makers of iron pipe.

The Walsh Manufacturing Company, Pittsburg, Penn., has secured a site on Jane street and will erect a plant for the manufacture of machinery for making paper barrels.

The Eureka Steel Company, Lowe and McKnight streets, Pittsburg, Penn., will be in the market for an open-hearth steel furnace, ten-inch finishing mill and blooming mill.

A. P. Heyer Company, Montclair, N. J., has been organized to manufacture motor cars, etc. Capital, $50,000. Incorporators, Arthur P. Heyer, Grover D. Smith, Wm. V. Crane.

C. Bryant & Sons, of Buffalo, N. Y., will erect a two-story brick machine shop at 1409 West avenue, that city. Special machinery for the local market will be manufactured.

The Adams & Westlake Company, manufacturer of railroad and ship hardware, has purchased a site at 2210 to 2226 Ontario street, Philadelphia, for the purpose of enlarging its plant.

The Hutchins-Kilbourne Company, Buffalo, N. Y., has been formed to manufacture wire and hardware specialties. Capital, $50,000. Incorporators, A. W. Lytle, O. J. Manchester, J. J. Price.

The Crescent Tool Company, Cincinnati, Ohio, has been organized with $10,000 capital to manufacture dies and metal specialties by Chas. Wasmen, Wm. R. Steltenpohl, John A. Reade, etc.

The C & M Garage and Sales Company, of Cleveland, Ohio, has been incorporated to conduct a garage and sell automobiles by

F. B. Conklin, R. J. Mckillip, E. Younger and W. K. Caldwell.

Hoagland Thayer, Inc., Newark, N. J., has been incorporated with $25,000 capital to manufacture automobiles, motors, engines, etc. Incorporators, Alger M. Hoagland, Geo. H. Thayer, Edw. B. Thayer.

The Johnson Coin Lock Company, Columbus, Ohio, has been organized with a capital of $25,000 to manufacture and sell coin locks and other specialties by Barton Griffith, M. M. Huffman, H. Miller, etc.

The Ewing American Motor Company, Ulster, N. Y., has been incorporated with $1,500,000 capital to manufacture automobiles. Incorporators, C. A. Hamlin, A. P. Anderson, H. Gorham, Jr.

The Direct Drive Gear Company, Paterson, N. J., has been incorporated to manufacture motor vehicles, engines, machinery, etc. Capital, $500,000. Incorporators, Wm. S. Evans, I. D. Brokaw, J. Wm. Hill.

Adams Manufacturing Company, Portsmouth, Ohio, has been incorporated to manufacture tools, machinery and mechanical devices by E. S. Adams, E. E. Adams, W. T. Adams, etc. Capital, $20,000.

The Newton Motors Company, Newark, N. J., has been incorporated to manufacture motors, engines, machinery, etc. Capital, $10,000. Incorporators, Arthur F. Egner, Wm. Elmer Brown, Jr., Conover English.

The Plumbers Fixture Manufacturing Company, Cleveland, Ohio, has been incorporated to manufacture plumbers' supplies. Capital, $10,000. Incorporators, W. H. Dettlebach, W. J. Bergens, E. P. Strong, etc.

Acme Cloth Shrinking Machinery Company, New York, has been incorporated to manufacture machinery and supplies for shrinking cloth. Capital, $100,000. Incorporators, A. W. D. Hogg, M. H. Bertram, etc.

The Oxy-Acetylene Appliance Company, Singer building, 149 Broadway, New York, contemplates being in the market soon for some machinery and would be pleased to receive catalogs of machinery, tools, etc.

The Kuhnert Aërial Construction Company, Hackensack, N. J., has been incorporated with $100,000 capital to manufacture flying machines. Incorporators, Fred Kuhnert, Matthew Andronico, Lester Gilbert.

The Auto Appliance Manufacturing Company, Akron, Ohio, has been organized to manufacture and sell automobile equipment and accessories by A. Auble, Jr., F. Oscar Evans, Chas. W. Steele, etc. Capital, $50,000.

The U. S. Expansion Bolt Company, New York, has been organized to manufacture bolts, hardware. Capital, $100,000. Incorporators, Frank M. Clute, 100 Broadway, Chas. S. Clark, 361 West Fifty-seventh street, etc.

The Acme Specialty Manufacturing Company, Toledo, Ohio, has been incorporated to manufacture and sell metal specialties, water heaters and metal furniture. Incorporators, A. Schlett, Chas. J. Schneider, Edna F. Evans, etc. Capital, $25,000.

The Steel Structural Works, Westfield, Penn., is erecting a new factory for the manufacture of fire escapes, ornamental iron work, etc. Will also engage in the repair of automobiles. Will be in the market for punches, shears, automobile repairs and machine-shop equipment.

The New York Central Iron Works will remove its plant from Geneva, N. Y., to Hagerstown, Md., having acquired a site on which a larger factory will be built. It is planned to build and equip the Hagerstown plant before removing material from Geneva or closing the place at that point.

The plant of the Rome Merchant Iron Mill, at Rome, N. Y., has been sold to a company closely identified with various iron industries, the president being E. M. Zehnder, president of the Scranton Bolt Manufacturing Company, Scranton, Penn., who is also connected with the American Locomotive Company. It is intended to increase the output of the mill to a considerable extent.

SOUTHERN STATES

The Hager-Elliott Engineering Company, Nashville, Tenn., has awarded contract for the construction of a two-story garage.

The Memphis (Tenn.) Automobile and Garage Company has been incorporated with $150,000 capital by J. W. Falls, R. H. Lake, N. C. Perkins, etc. Will equip a large repair shop.

WEST OF THE MISSISSIPPI

Peter Dufresne, Pocatello, Idaho, will build a new commercial garage and repair shop.

C. R. Lewthwaite, Portland, Ore., will build a commercial garage and repair plant.

L. H. Lovelace, First avenue, Spokane, Wash., will build a commercial garage and repair plant.

The Southern Hay Press Company, of Silver Creek, Miss., will establish a factory at Houston, Tex.

The Dorris Motor Car Company, St. Louis, Mo., will, it is said, erect an addition to cost about $250,000.

The Griffin Wheel Works, Tacoma, Wash., has had plans prepared for a pattern-shop addition to its plant.

The Idaho National Harvester Company, Moscow, Idaho, has had plans prepared for an addition to its plant.

Luckett Brothers, Coleman, Tex., are arranging to install a general automobile and machine shop. Building is being erected.

The Cole Motor Car Company has broken ground for the erection of a large machine and assembling plant at San Francisco, Cal.

Edgar J. Daly, Portland, Ore., is having plans prepared for a commercial garage and repair plant. Modern equipment will be installed.

The Oregon Trunk Line will build a roundhouse and repair shops at Fallbridge, Ore. (Crook county), on the route of its new extension.

The Farmers' Foundry and Irrigation Supplies Manufactory, Upland, Cal., is planning to increase the plant and will enlarge its foundry.

Graham & Crawford are erecting a building on South Pearl street, Mart, Tex., which they will equip for a general metal works business.

H. G. Hadwins, Second avenue, Spokane, Wash., will build a new commercial garage and repair shop. Modern equipment will be installed.

Manual training equipment will be installed in the Thompson and Holladay schools, Portland, Ore. T. J. Jones, architect, Portland, is preparing plans.

The Southern Pacific Railroad is planning to install new repair shops at Goshen Junction, Cal. Both car and locomotive work will be cared for.

Charles M. Stimson, Los Angeles, Cal., has taken out a permit to make alterations and additions in his foundry and machine shop at North Main street.

The Frank J. Kimball Company, Los Angeles, Cal., has acquired property and will establish a machine shop and plant for the manufacture of gas engines.

Bell, Wildman & Co., Portland, Ore., operating machine shops on Second street, near Burnside, have purchased site for a new plant at Thirty-third and Halsey streets.

The School Board, Alhambra, Cal., will introduce manual-training departments in its schools. Bonds will be issued to purchase equipment. J. L. Davidson is secretary of the board.

The Wood-Knight-Hawk Company, Oklahoma City, Okla., has been incorporated to manufacture a new motor plow. Capital, $400,000. H. D. Knight, of Oklahoma City, will be president.

The Iowa Pump and Silo Company, of Des Moines, Iowa, will move to Indianapolis, Ind., where the building on Missouri and Walnut streets, formerly occupied by the Knight & Jillson Company, has been secured.

Machine-shop equipment for manual training will be installed in the new school group to be erected at Anaheim, Cal. A department for mechanical drawing will also be established. Plans by J. C. Austin, architect, Los Angeles, Cal.

CANADA

Beatty Brothers, Fergus, Ont., are erecting a machine shop and foundry.

The Down Draft Furnace Company, of Galt, Ont., is making extensions to its factory.

The Masco Company will locate a plant at Toronto for the manufacture of electrical supplies.

Messrs. McDougall and Jenkins will equip a $150,000 foundry and plant at North Vancouver, B. C.

The National Transcontinental Railway will equip new coach shops to cost $2,500,000 at Winnipeg.

Fire again destroyed the plant of the Ives Bedstead Company; also the Canada Machinery Company on Wellington street, Montreal, Quebec.

GENERAL MANUFACTURING

NEW ENGLAND

The town of Whitefield, N. H., will build a new power house.

The Nashua Paper Company, Groton, Mass., will install steam boilers.

John R. Harris, Lawrence, Mass., will install a refrigerating plant.

Beal & Walker's lumber mills at Pittsfield, Me., were burned. Loss, $15,000.

Thomas Hersum & Co., New Bedford, Mass., will install a boiler and engine.

The Lowell Gas Light Company, Lowell, Mass., will build a new power house.

The Squantum Association, of Squantum, R. I., will build a new pumping station.

The town of Rockport, Mass., is contemplating installing a municipal light plant.

The Nashua (N. H.) Coated Paper Gum Company will build an addition to its factory.

The Fairfield County Dairy Company will erect a dairy plant at South Nowark, Conn.

The Colored Worsted Company, of Providence, R. I., will build an addition to its mill.

Topsham, Me., will make improvements in its water system. A new reservoir will be built.

The Wachusett Thread Company, of Worcester, Mass., will install boiler, engine and pumps.

John J. Hurley, Revere Beach, Mass., is in the market for a 10-horsepower, three-phase motor.

The Alsace Worsted Company, Woonsocket, R. I., is to have a large addition built to its present factory.

The Pentucker Associates will install two new boilers for heating its shoe shop at Haverhill, Mass.

The Mattatuck Manufacturing Company, Waterbury, Conn., is preparing to build a new power house.

The Thames Dye and Bleachery Company, Montville, Conn., is to erect a three-story addition to its plant.

The Metropolitan Carriage Company, Bridgeport, Conn., is preparing plans for an addition to its factory.

Foundations are being laid for a new power house at the plant of the Waltham (Mass.) Bleachery and Dye Works.

The New York, New Haven & Hartford Railroad will build an addition to its power house at Greenwich, Conn.

The factory of the Faulkner Woolen Company, Stafford Springs, Mass., was badly damaged by fire. Loss, $12,000.

The Brightwood mills of the Fiske Paper Company, at Hindsale, N. H., were destroyed by fire. Loss, $40,000. Will be rebuilt.

The Lowell (Mass.) Gas Light Company has been granted a permit for the erection of a new brick power house. Cost, $200,000.

The Fuller-Holway Company, of Augusta, Me., contemplates erecting a grain elevator and equipping it with modern milling machinery.

The County Commissioners of Bristol county, Mass., will install two horizontal return-tubular boilers at the New Bedford House of Correction.

Perkins, Avery Company, of Holyoke, Mass., has purchased a mill at Cushman and it is reported will make an addition for manufacturing tissue paper.

The Mishaum Knitting Company, New Bedford, Mass., which is soon to reorganize and incorporate for $100,000, contemplates removing its plant to Woonsocket, R. I.

Sealed proposals will be received at the Watertown Arsenal, Watertown, Mass., up to 1 p.m., June 1, for furnishing during year ending June 30, 1912, rope, rod brass and bronze, bar steel, nails, foundry supplies, hose, twist drills, incandescent lamps etc. Information furnished on application to the commanding officer.

MIDDLE STATES

Akron, Ohio, will erect a municipal water plant.

David Morris & Son will erect a creamery at Perkasie, Penn.

The Racine (Wis.) Basket Company is erecting an addition.

The feed mill of W. B. Stewart, at South Plymouth, N. Y., burned.

The Crystal Paper Company, Amanda, Ohio, will build a new power plant.

Fire destroyed the plant of the National Fireworks Company, Belleville, N. J.

Ohio Varnish Company's plant at Cleveland, Ohio, was burned. Loss, $10,000.

Additions are to be made to the power plant of the Schenley hotel, Pittsburg, Penn.

The plant of the Home Heating Company, Anderson, Ind., is to be rebuilt and enlarged.

Fire caused $15,000 damages in the box factory of Shelp & Vandergrift, 822-32 North Lawrence street, Philadelphia, Penn.

Preparations are being made for rebuilding the plant of the Knox County Glass Company at Mount Vernon, O., recently burned.

The plant of the Crandall Packing Company, Palmyra, N. Y., has been destroyed by fire.

The plant of the Milton Electric Light Company, of Milton, Del., was destroyed by fire.

The carriage factory of S. J. Wilson & Son, of Milton, Del., was badly damaged by fire.

The Rodenhausen Excelsior Wagon Works, Philadelphia, Penn., will enlarge its power plant.

The Swansdown Knitting Company, Hudson, N. Y., is erecting a large addition to its plant.

The creamery and ice house of the Hudson Valley Dairy Company, Walden, N. Y., was burned.

The mills of the Royal Flour and Corn Mills Company, Milton, Del., were destroyed by fire.

The capacity of the Millville Gas Company's plant at Millville, N. J., is being doubled.

The William Kaiser box-shook factory, at Stillwater, Minn., was destroyed by fire. Loss, $200,000.

The Manheim Manufacturing and Belting Company is having a factory built at Manheim, Penn.

Power plant will be installed in Lorain County infirmary. Chas. Chandler, clerk, Elyria, Ohio.

Fire did $150,000 damage to the plant of the Union Bag and Paper Company, at Hudson Falls, N. Y.

The Keystone Type Foundry Company is building a three-story factory, 60x240 feet, at Chester, Penn.

The town council, of Milton, Del., is going to appropriate money to install a waterworks and pumping system.

Four buildings of Daniel Levans, Jamestown, Penn., fertilizer-manufacturing plant, were destroyed by fire.

Power-plant equipment will be required for the new Lakeside hotel, Cleveland, Ohio. M. L. Steuer, Cleveland, Ohio.

Philadelphia Brewing Company is building an addition at Fifty-fourth and Market streets, Philadelphia, Penn.

Fire damaged the packing department of the United States Asbestos Works, at Manheim, Penn. Loss, $25,000.

Hubbard, Eldridge & Miller, chair manufacturers of Rochester, N. Y., are planning an addition to their plant.

The Cooper Paper Box factory is erecting a three-story factory at Sycamore and Mortimer streets, Buffalo, N. Y.

Waterproof Paper and Board Company, Cincinnati, Ohio, has increased its capital and will make improvements.

The hosiery mill of William McMann, of 2168 Firth street, Philadelphia, Penn., was damaged by fire. Loss, $8000.

The Waterford (N. Y.) Waterworks Company is considering the construction of a new plant, to cost about $50,000.

The Blairsville (Penn.) Enamel Ware Company is contemplating the establishment of a bathtub factory at Yonkers, N. Y.

The Sherwood Shoe Company, Rochester, N. Y., will build a $23,000 addition to its plant on South Goodman street.

Mendelson's Sons, Albany, N. Y., manufacturers of potash and lye, contemplate rebuilding their plant on an enlarged scale.

The Belber Trunk and Bag Company is to build a one-story power plant at Hancock and Turner streets, Philadelphia, Penn.

The plant of the Philadelphia Rubber Works, of Thirty-seventh and Reed streets, Philadelphia, Penn., was damaged by fire.

Eagle Woodenware Manufacturing Company, Hamilton, Ohio, has been incorporated by Joseph Kelly to manufacture woodenware.

The Superior Box Company, of Superior, Wis., has leased a building in Cincinnati, O., which will be used as an assembling plant.

Fire destroyed the main factory of the Cape May Glass Company, at Cape May Court House, N. J., causing a loss of about $50,000.

The Bibb Sewer Pipe Company, a new $200,000 corporation, will erect a plant adjoining the Bibb Brick Company's plant at Macon, Ga.

Krause Konstant Carbureter Company, Cleveland, Ohio, has been incorporated for $15,000 by R. E. Krause and others, to make carbureters.

The Seaside Park Borough Council are contemplating an expenditure of $35,000 on a water, sewer and lighting plant at Seaside Park, N. J.

C. W. Hooven, who controls the Anderson Gas Company, Anderson, Ind., is considering the erection of a new steam-heating plant for public service.

The Canton (Ohio) Electric Company will build an addition to its power plant and is said to be planning other improvements to cost $300,000.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids May 31, for two gasolene engines as per Schedule 3558.

The Western Manufacturing Company, Toledo, Ohio, manufacturing sash, doors, blinds, etc., will erect a new factory at Water and Walnut streets.

Louis Burk has purchased a site in the vicinity of Third street and Girard avenue, Philadelphia, to be used as an addition to his meat-packing plant.

Swift & Co. have purchased property on East Market street, Buffalo, N. Y., and are erecting a two-story building to be equipped as a cold-storage house, etc.

The Euclid Doan Power Company, Cleveland, Ohio, has been incorporated to furnish electrical power for commercial use by S. H. Seibert, Jos. Morgenstern, etc.

The Harvey Fiber Carpet Company will build a three-story factory on the west side of Janney street, south of Allegheny avenue, Philadelphia, Penn., to cost $27,500.

The plant of the Southwark Manufacturing Company, on Winslow street, Camden, N. J., was damaged by fire. Loss, $12,000. The company manufactures chalk and whiting.

Henry Holmes & Sons, Incorporated (the Sherman Mills), Philadelphia, Penn., will erect three new buildings for the manufacture of machine-printed tapestry, carpets and rugs.

The Warner Jewelry Case Company has purchased a four-story building at 642 to 648 Michigan street, Buffalo, N. Y., in which a general line of jewelers' boxes will be manufactured.

The Indiana Chemical Company, Gas City, Ind., has been incorporated with a capital of $25,000 by B. F. Burk, C. H. Rothinghouse and Fred Rothinghouse to manufacture chemicals.

The Syracuse Lighting Company, Syracuse, N. Y., has filed application with the Public Service Commission for permission to issue $470,000 in bonds for the purpose of improving the plant.

The Virginia-Carolina Chemical Company, of Atlanta, Ga., has decided to establish a fertilizer plant at Cincinnati, Ohio. It has acquired ten acres of land and will erect a $150,000 plant.

The plant of the King Construction Company, manufacturers of greenhouse equipment, at North Tonawanda, N. Y., was burned, with a loss of $35,000. It will be rebuilt at once.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids May 31, for wood-turning lathe, surfacing machine (schedule 3557), three steel tanks (schedule 3556).

The Herringer Paper Company, Cincinnati, Ohio, has been organized with a capital of $10,000 to manufacture paper and cordage by Edward F. Peters, B. S. Oppenheimer, E. M. Schwein, etc.

The Wagstaffe Company, of Hamilton, Ont., manufacturer of canned fruits, etc., has bought five acres of land at Suspension Bridge, N. Y., and will erect a plant to give employment to about 450 hands.

Proposals will be received at the Army building, Whitehall street, New York, until 3 p.m., June 15, for installing six pumps and accessories at Fort Mills, P. I. M. Gray Zalinski, depot quartermaster.

The Buffalo Lounge Company, located on Exchange and Hamburg streets, Buffalo, N. Y., has purchased the property formerly occupied by A. & H. C. Knowlton, between Seneca and Carroll streets, for additional space.

The Terre Haute Electrical Porcelain Company, Terre Haute, Ind., has been incorporated with a capital of $25,000 by W. H. Glover, E. R. Hamilton and J. A. Hamilton, to conduct a manufacturing business.

The Seufferle Cooperage Company, Cincinnati, Ohio, has been incorporated to manufacture and sell boxes, barrels and all kinds of cooperage by Wm. Seufferle, Edw. F. Peters, A. A. McGregor, etc. Capital, $50,000.

The Eagle Woodenware Manufacturing Company, Hamilton, Ohio, has been organized with $50,000 capital to manufacture wooden articles of all kinds by Frank M. Fritsch, Charles Dresbach, Edward F. Fritsch, etc.

The Middletown Gas and Electric Company, Middletown, Ohio, has absorbed the Middletown Lighting Company, of the same place, and plans are being prepared for additions and betterments to the electric-light plant.

The Butzbach Fruit and Cold Storage Company, South Bend, Ind., has been incorporated with a capital of $300,000. Directors, George, Samuel G., and Morris R. Butzbach, L. J. Solari and F. A. Deahl. Will erect a six-story building.

Proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 o'clock a.m., May 27, for air, steam, water and electric meters. Specifications can be obtained upon application to R. C. Holyday, chief of bureau.

The Universal Paint Company, which is affiliated with the Universal Smoke Separating Company, of Syracuse, N. Y., has under contemplation the establishment of a paint factory at Syracuse or nearby, to manufacture paint from the carbon obtained from smoke stacks.

SOUTHERN STATES

Morganton, N. C., voted $35,000 bonds for waterworks.

Marietta, Ga., voted $20,000 bonds for an electric-light plant.

Nortonville (Ky.) Traction Company will erect an electric-light plant.

Grafton, Fairmont & Clarksburg Railway will erect a power house at Grafton, W. Va.

The Illinois Leather Company has secured permit for a two-story factory to be erected at 2424 Duncan street, Louisville, Ky.

The Orlando (Fla.) Water and Light Company will install a 2,000,000-gallon pump, 500-kilowatt generator and engine and make other improvements.

WEST OF THE MISSISSIPPI

The city of Sheridan, Ore., will install a waterworks system.

The city of Haines, Ore., has voted bonds for a new water system.

The flour-mill plant of E. M. Kimball at Jordan Valley, Ore., was destroyed by fire.

Fire destroyed the lumber plant of the Leona (Ore.) Mill Company. Loss, $60,000.

Wetumpka, Okla., voted $10,000 bonds for extending its electric-light system and waterworks.

The Libby Creek Placer Mining Company, near Libby, Mont., is planning to build a new sawmill.

The city of The Dalles, Ore., is planning to install a new sewer system. Estimated cost, $500,000.

Kelley & Morgan, Aberdeen, Wash., will establish a factory for the manufacture of rawhide goods.

The plant of the Fort Scott (Kan.) Gas and Electric Company was destroyed by fire. Loss, $100,000.

Earl Simmons, Coburg, Ore., has purchased property and will erect a sash and door factory and planing mill.

The Armsby Preserving Company, Yuba City, Cal., will increase the capacity of its fruit-preserving plant.

The Citrus Belt Land Company, Corona, Cal., will install a large pumping plant in the immediate future.

The lumber-mill plant of the Leona Mill Company, Cottage Grove, Ore., was destroyed by fire. Loss, $60,000.

The Inland Brewing and Malting Company, Spokane, Wash., has broken ground for the erection of a new plant.

The Utah Ice and Cold Storage Company, Salt Lake, Utah, has taken out a permit to build an addition to its plant.

The Spokane Fruit Growers' Association, Otis Orchards, Wash., has had plans prepared for a new packing plant.

The Low Pass Mining Company, Granite, Colo., will build a new hydroelectric power plant in the near future.

The plant of the Illinois-Pacific Glass Works, San Francisco, Cal., was partially destroyed by fire. Loss, $300,000.

The city of Hermiston, Ore., is planning for the installation of a new waterworks system. Plans will be prepared.

Emil Lehnhardt, Oakland, Cal., is having plans prepared for a large candy factory. The plant will be fully equipped.

R. Shannon, Oakland, Cal., has taken out a permit to build a new creamery plant. Modern equipment will be installed.

The Donner (Cal.) Ice Camp, near Truckee, will build a 50,000-ton ice-storage plant for precooling purposes in the near future.

The Terminal Ice and Cold Storage, Portland, Ore., has taken out a permit to make improvements and additions in its plant.

The city of Hemet, Cal., will install a new sewer system. A bond election will soon be called. About $50,000 will be expended.

J. H. Calvin and John Hogan, Pendleton, Ore., are contemplating the erection of a factory for the manufacture of brooms.

The Winnemucca (Nev.) Water and Light Company will enlarge its water and power plants. New machinery will be installed.

The Desert Power and Water Company, Kingman, Ariz., will issue bonds for $400,000 for improvements and extensions in its power plant.

W. W. Wilson and James Jensen, Sandy, Utah, will install a large pumping plant on the Jordan river near Riverton in the near future.

The Plumas Power Company, Quincy, Cal., is planning to build a new power plant in this vicinity, to supply the Indian Valley district.

The Everett (Wash.) Oxyacetylene Company gas plant was destroyed by an explosion. All machinery for gas manufacturing was destroyed.

The Indian Valley Power Company, Greenville, Cal., is planning to enlarge and increase the capacity of its power plant. O. C. Pratt is head of this company.

The California Fruit Canners' Association, San Francisco, Cal., has taken out a permit to make improvements and additions in its canning factory.

Power-plant equipment will be required in the 10-story office building to be erected by the Guaranty Oil Company, Los Angeles, Cal. Estimated cost, $500,000.

The Santa Fe railroad is planning to install a series of new traveling cranes in its shops at San Bernardino, Cal. H. S. Wall is superintendent of shops.

The Suitorium Dye House, Los Angeles, Cal., has taken out a permit to erect a new dye works addition to its plant. Modern equipment will be installed.

The United States Laundry Company, Portland, Ore., has purchased property and will build a steam-laundry plant. Modern machinery will be installed.

W. F. Boardman & Co., San Francisco, Cal., has been granted a gas franchise at Roseburg, Ore., and is planning to install a gas plant in the near future.

The Oro Water, Light and Power Company, Oroville, Cal., has acquired a power site on the Feather river, near Quincy, and will build a hydroelectric plant.

J. H. Eisenhart's Sons Company, San Francisco, brick manufacturers, is planning to build a plant at Vancouver, B. C., for the manufacture of cement brick.

Power-plant equipment will be required in the new theater which is contemplated at Tacoma, Wash., by John W. Considine, Seattle. Estimated cost, $500,000.

The Bonner Light and Water Company, Bonners Ferry, Idaho, will enlarge its power plant and install new machinery. H. A. Gale is manager of this company.

The Great Western Power Company, San Francisco, Cal., will increase the capacity of its power plant at Las Plumas on the Feather river. Estimated cost, $1,000,000.

The Fallon Sugar Company, Tonopah, Nev., is having plans prepared for a new beet-sugar factory. The plant will be fully equipped with necessary machinery.

Benjamin Holst, Oxnard, Cal., is at the head of a company which is planning to build a fruit-canning factory at Fillmore. Edwin Kellog, Ventura, is also interested.

Henry A. Meyers, Placerville, Cal., has filed a water appropriation on the Middle Fork of the Cosumnes river, and is planning to build a power plant on this site.

Power-plant equipment will be required for the new 10-story building which is to be erected by the Tacoma (Wash.) Lodge of Elks. Plans will soon be prepared.

In connection with its large paper mill, now building, the Inland Empire Paper Company, Millwood, Spokane, Wash., will build a 7000-horsepower hydroelectric plant.

The Olympia-Portland Cement Company, Limited, Bellingham, Wash., will build a new cement plant. A. R. Campbell, engineer, Bellingham, is interested in this work.

The substation of the San Bernardino (Cal.) Valley Traction Company at Arrowhead Springs, was destroyed by fire. Loss $7000. The machinery was demolished.

The city of Elsinore, Cal., is favoring the installation of a pumping plant in connection with its proposed sewer system. The Board of Trustees has the matter in charge.

A waterworks system to cost about $20,000 will be installed at the new Northern Hospital at Sedro-Woolley, Wash. The State Board of Control, Olympia, is in charge of this work.

The Red Bluff (Cal.) Creamery has been organized by H. P. Stice and Frank Gilmore. The company will soon build a modern creamery and equip it with necessary machinery.

Power-plant equipment will be required in the new apartment hotel to be erected by A. E. Eisen, San Francisco, Cal. F. H. Meyer, architect, San Francisco. Estimated cost, $100,000.

Power-plant equipment will be required in the new building to be erected by the Heidinger Investment Company, Spokane, Wash. Estimated cost, $125,000. Cutter & Malmgren, architects, Spokane.

The Dallas Coöperative Creamery Association has been organized at Corcoran, Cal. The company will build a new creamery plant in this section. V. L. Reynolds is interested in this organization.

The Colorado State College at Fort Collins, Colo., is about to put in a central heating and lighting plant on the campus to cost about $75,000. Prof. J. W. Lawrence, of the college, is the engineer.

Power-plant equipment will be required in the new 8-story hotel to be erected at San Francisco, Cal., by John Martin. Estimated cost, $400,000. MacDonald & Applegarth, architects, San Francisco.

Power-plant equipment will be required in the new 7-story hotel to be erected by Morris Brown, San Francisco, Cal. Estimated cost, $150,000. Plans will be prepared by G. A. Lansburgh, architect, San Francisco.

Power-plant equipment will be required in the proposed 12-story office building to be erected by F. G. Ryan & Co., Los Angeles, Cal., on Sixth street. Plans prepared by Reed Brothers, architects, San Francisco. Cost, $310,000.

The Blythe City (Cal.) Ice and Cold Storage Company will build a new creamery plant, an ice-manufacturing plant and electric-lighting plant. Modern machinery will be installed throughout. B. D. Lockard is interested in this company.

The Utah Silica Brick and Fire Clay Company has been organized at Salt Lake, Utah by J. S. Sharp and H. K. Masters, with a capital stock of $500,000. The company owns property near Draper and will erect a brick-manufacturing plant of 20,000 daily capacity. Improved machinery will be required.

The Pacific Fisheries Company and the Parks Fish Company, both of Aberdeen, Wash., have been consolidated under the name of the Pacific Fisheries and Packing Company. The company will extend its business and plant. A department will be established for the curing and canning of salmon.

CANADA

Knowlton, Quebec, will equip a municipal power plant.

R. Stuart will build a new power plant at Sandwich, Ont.

A large new power station will be built at Magog, Quebec.

Melville, Sask., will install a complete new electric-lighting plant.

Scott, Sask., will install a complete new electric-lighting plant.

The Cloisonne Glass Company, Berlin, Ont., is erecting a new factory.

Kamsack, Sask., will install a new waterworks pumping system.

The J. McBrien Trunk Company, Berlin, Ont., is erecting additions.

The Elora Furniture Company, of Elora, Ont., will extend its factory.

The D. Hibner Furniture Company, Berlin, Ont., is to build an addition.

W. H. Merriman will erect a large canning factory at St. Catharines, Ont.

Battleford, Sask., will install a complete new waterworks pumping plant.

Welland, Ont., will buy $75,000 worth of waterworks pumping machinery.

Niagara on the Lake, Ont., will install a new waterworks pumping plant.

The Regina Plumbing Company, of Regina, Sask., will locate a new plant there.

The Lang Tanning Company, Berlin, Ont., is to make a large extension to plant.

The Kaufman Rubber Company, Berlin, Ont., is making extension to its plant.

Adams Furniture Company, of Toronto, will erect a furniture factory at Owen Sound.

Messrs. Hall and Utting, of Galt, Ont., will double their cabinet factory and mill.

Renfrew, Ont., will spend $125,000 for new electrical equipment for its power house.

The Western Shoe Company is erecting a large addition to its plant at Berlin, Ont.

The Independent Tire Company, a new concern, will locate its plant at Guelph, Ont.

North Bay, Ont., will buy $100,000 worth of electrically operated waterworks machinery.

C. L. Lloyd & Co., of Toronto, will erect a factory for baby carriages, etc., at Owen Sound, Ont.

Tavistock, Ont., will install electrically operated pumps for waterworks purposes. Cost, $30,000.

The Saskatoon Cordage and Flax Fiber Company will locate a big new factory at Saskatoon, Sask.

The Eel River Light, Heat and Power Company will equip a big, new power plant near St. John, N. B.

Fire destroyed the testing department of Allis-Chalmers Bullock Company, at Lachine, Que. Loss, about $100,000.

Knitting factory will be erected at Owen Sound, Ont., by Lake & Ward, formerly at Alton, to cost about $30,000.

The Prince Rupert Power Company will equip a $3,000,000 plant at Prince Rupert, B. C., for lighting and other purposes.

Messrs. Dowler and Gowanlock, of Fort William, Ont., are at the head of a large new plant that will be located there to manufacture sewer pipe.

MINING

The Captain Ward mine, near Coulterville, Cal., will erect a 20-stamp mill.

The Lindsay mine, Flyaway, near Coulterville, Cal., will erect a new stamp mill.

The Success Mining Company, Nelson, Nev., will soon be in the market for a new milling plant.

The Rainbow mine, near Chloride, Nev., will install an aërial tramway in the near future.

The South Eureka mine, Sutter Creek, Cal., is contemplating the installation of a new stamp mill.

The Ray Central Copper Company, Ray, Ariz., is contemplating the installation of a cyanide plant.

The Rhoads Hall mine, Bedrock creek, Fairbanks district, Alaska, will install a new stamp mill.

The Caveny mines, Comobabi Mountain district, near Tucson, Ariz., will install a new cyanide plant.

The San Luis mine, near Sierra City, Cal., is planning to install a new quartz mill in the immediate future.

The Tonopah-Belmont mine, Tonopah, Nev., is contemplating the installation of 500-ton concentrating plant.

The Sunrise mine, Kelsey district, near Placerville, Cal., will install a 10-stamp mill and other machinery.

The Nevada Superior Mining Company will erect a concentrating plant at its property near Imlay, Humboldt, Nev.

The Molly Gibson Concentrator, near Nelson, B. C., will be remodeled and improved. New machinery will be installed.

The Red Ruth mine, George's cañon, near Manhattan, Nev., is contemplating the installation of a concentrating plant.

The Mendha-Nevada Mining Company, Ploche, Nev., is contemplating the installation of a 50-ton concentrating plant.

The Champion mine, near Coulterville, Cal., will install a new stamp mill in the near future. George Gow is manager of this property.

The Gold Nugget mines, Nelson district, B. C., have been acquired by A. E. Baker and J. T. Hillis, Vancouver, B. C. A new cyanide plant and stamp mill will be erected.

The Universal Mining and Development Company, San Diego, Cal., has purchased the Noble mines in the Pine Valley (Cal.) district, and is planning to install a reduction plant.

The Oregon Legislature, Salem, Ore., has made an appropriation for a mines building and Bureau of Mines. Mining machinery of all kinds will be installed in the proposed building for demonstration purposes.

BUSINESS ITEMS

The New York warehouses of the Niles-Bement-Pond Company have been removed from 30 West street to Hudson and Van Dam streets, where a large stock of Pratt & Whitney small tools of all kinds will be kept on hand.

The new foundry of the Hess Steel Castings Company, Bridgeton, N. J., is now completed and castings are being poured. The process used originated with the Flexilis Werke, of Germany, and possesses new possibilities in the production of automobile and engine parts, high-pressure piping and other difficult shapes where the quantity or form does not justify the use of dies.

The Reynolds Machine Company, Moline, Ill., has consolidated with the Tri-City Pattern and Machine Company, of that city, and the new organization will be known as the Reynolds Pattern and Machine Company. The new organization has purchased the equipment of the Muscatine Motor Company, of Muscatine, Iowa, and has installed it with the equipment of both the above-mentioned concerns.

TRADE CATALOGS

Mesta Machine Company, Pittsburg, Penn. Catalog. Gas engines. Illustrated, 16 pages, 6x9 inches, paper.

Landis Tool Company, Waynesboro, Penn. Pamphlet. Making and Repairing Locomotive Parts. Illustrated.

Theo. Alteneder & Sons, Philadelphia, Penn. Catalog. Drawing instruments. Illustrated, 110 pages, 5x7½ inches, paper.

D. A. Hinman & Co., Sandwich, Ill. "The Bending Book." Hand bending tools. Illustrated, 16 pages, 4x8 inches. paper.

The Oster Manufacturing Company, Cleveland, Ohio. Catalog No. 26. Threading tools. Illustrated, 64 pages, 6x9 inches. paper.

The Cushman Chuck Company, Hartford, Conn. Catalog. Chucks and face-plate jaws. Illustrated, 32 pages, 5x8 inches, paper.

Firth-Sterling Steel Company, McKeesport, Penn. Catalog. Blue Chip high-speed steel, tool steels. 64 pages. 3½x6½ inches, paper.

Crocker-Wheeler Company, Ampere, N. J. Bulletin No. 128. Form W motors for rolling mills. Illustrated, 12 pages, 7½x10 inches. Bulletin No. 129. Direct-current crane and hoist motors. Illustrated, 20 pages, 7½x10 inches. Bulletin No. 132. Form I machines, belt type, direct current. Illustrated, 16 pages, 7½x10 inches.

Catalogs Wanted

O. W. Holmes Company, 176 Federal street, Boston, Mass., efficiency engineers, would be pleased to receive catalogs from manufacturers. Expect to be in the market for machine tools from time to time.

Forthcoming Meetings

National Machine Tool Builders' Association, spring meeting, May 18-19, 1911, Hotel Marlborough-Blenheim, Atlantic City. Chas. E. Hildreth, secretary, Worcester, Mass.

International Master Boiler Makers' Association, Omaha, Neb., May 23, 24, 25, 26, 1911.

American Foundrymen's Association, annual convention, Pittsburg, Penn., May 23 to 26, 1911. Richard Moldenke, secretary, Watchung, N. J.

American Society of Mechanical Engineers, spring meeting, Pittsburg, Penn., May 30 to June 2, 1911. Secretary, C. W. Rice, 29 West 39th St., New York City.

Society of Automobile Engineers, midsummer meeting, Dayton, Ohio, June 15, 16 and 17, 1911. C. F. Clarkson, secretary, 1451 Broadway, New York city.

American Society of Engineer Draftsmen, regular meeting third Thursday of each month. H. F. Sloan, secretary, 116 Nassau street, New York city.

The Institute of Operating Engineers. Regular meeting second Thursday of each month, Engineering Societies building, New York City. M. W. Rice, secretary, 29 West Thirty-ninth street, New York City.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. S. Clark, secretary, 141 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

Philadelphia Foundrymen's Association; meetings first Wednesday of each month, Manufacturers Club, Philadelphia, Penn. Howard Evans, secretary, Pier 45 North, Philadelphia, Penn.

WANTS

Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday noon for ensuing week's issue. Answers addressed to our care, 505 Pearl Street, New York, will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.

Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

Self-setting planes. Vineland, N. J.

Special machinery developed and manufactured. Tompkins Bros. Co., Troy, N. Y.

Wanted—To buy a small machine shop in New England. Box 778, Amer. Machinist.

We buy or pay royalty for good patented machine or tool. Box 282, Amer. Machinist.

"Engineering Data" is gaining ground. It helps others, why not you Box 788, Am. Ma.

Wanted—Work for screw machines and gear cutter. Box 775, American Machinist.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Our machine shop solicits either patented article or small machine or tool to manufacture; royalty or cash. Box 853, Am. Mach.

Punches and dies, jigs and fixtures, light and medium weight machinery, etc., built to order. Taylor-Shantz Co., Rochester, N. Y.

Wanted—Machine and press work; tools, dies, jigs and machines built to order. The G. M. Diehl Machine Works, Wabash, Ind.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 990 G St., Washington, D. C. Write for Inventor's Handbook.

Wanted—Work for gear cutters, hand turrets, milling machines, etc.; fine work in quantities. The Seneca Falls Mfg. Co., Seneca Falls, N. Y.

Competent mechanical engineer, N. Y. City, designs special and automatic machines and tools for all kinds of duplicate work; highest references. Box 852, Amer. Machinist.

Light and medium weight machinery and small parts in quantities; also screw machine and punch press work, tools, jigs, dies and high grade machinery. The Elgin Tool Works, Elgin, Ill.

We can save you time and money, designing your machinery, tools, jigs and fixtures; let us develop your ideas and make your patent office drawings. Toledo Engineering Co., 544 Oakwood Ave., Toledo, Ohio.

Large English firm of machine tool importers having showrooms and offices in Great Britain, France, Germany, Italy, India and Japan is wanting good agencies for machine tools of all kinds. Box 189, Amer. Mach.

For lease, new two story machine shop, 60x150, fully equipped; now running, located in southwestern part of Indiana with switch facilities; or will combine with party having good light mechanical line. Box 838, Am. M.

Wanted—Owner of good machine shop to look into merits of new screw cutting die head (already in successful operation) with view to manufacturing and marketing same; patent pending. L. E. Adee, Mt. Clemens, Mich.

Welding by oxy-acetylene process; special attention given to repairs of machinery and castings of all kinds; large experience in difficult experimental work; structural shapes welded together; write for particulars. Krajewski-Pesant Co., 54 Beard St., Brooklyn, N. Y.

Wanted—Machine work; a thoroughly well equipped machine tool shop, having accumulated considerable of its own product, and desiring to employ its full organization, is open for work of good class, and solicits contracts from $500 to $50,000; location, Central West. Box 765, American Machinist.

Auto cases, first quality, 28x3, $10.30; 30x3, $11.30; 30x3½, $15.45; 32x3½, $16.70; 32x4, $21.45; 34x4, $23.10; 1 ship, allow tires to be examined before payment is made; send 10 per cent. with order; send for price-list on all sizes; also motor cycle cases and tubes, at very low prices; the largest tire dealer in the Central States. W. Vanderpool, Springfield, O.

Foreign representative; young, French engineer; energetic, thorough knowledge of technical and commercial English, both oral and written, also well up in workshop practice, wishes to get in touch with reliable manufacturing concern in the States, producing either special machine tools, tools or mechanical appliances of a very practical and original nature, in order to introduce its goods in France; could do some fine business with enterprising firm. Write, Maud, Poste 093, Bureau 10, Paris, France.

Help Wanted

Classification indicates present address of advertiser, nothing else.

CONNECTICUT

Wanted—A good engineer and designer to take charge of drafting room of machine shop in Connecticut; man with experience in shop as well as in office preferred. Send application to "W," Care American Machinist.

ILLINOIS

Wanted—High grade man as master mechanic and tool room foreman; must be absolutely first class, good executive and systematizer; telephone work; factory in Chicago. Box 873, American Machinist.

Draftsmen for our engineering department, technical men of proven ability, those with experience in the design of special equipment for manufacturing plants preferred; opportunities for advancement; in reply state exact experience and qualifications. Address "Chief Engineer," Deere & Co., Moline, Ill.

KENTUCKY

Wanted—Man thoroughly familiar with gasolene motors and some motor boat experience, to run three large engines on houseboat cruising on western rivers; permanent situation; to live on the boat. Address, giving age, experience, references, etc., Box 847, Am. Ma.

MASSACHUSETTS

Wanted—First class grinder on automobile parts, capable of handling three or four men; Landis and Brown & Sharpe machines. Box 866, American Machinist.

Agents wanted in every factory for best hand soap on market; cleanses hands quickly and thoroughly. Worcester Chemical Co., 642 Pleasant St., Worcester, Mass.

Wanted—Inspector on automobile parts; factory near Boston; only first-class man considered; state experience and wages expected. Box 865, American Machinistt.

MICHIGAN

Wanted—High-grade detail draftsmen and tracers, experienced on automobile work; must be neat and accurate; state age, education and salary expected. Address John Springer, chief draftsman, Brush Runabout Company, Detroit, Mich.

Wanted—Superintendent for a roller bearing factory; must have exceptional mechanical ability; experienced in all branches; accustomed to very accurate work and capable of handling help to best advantage; give age, experience in detail, salary expected and references; replies will be treated confidential and not used without permission. Box 857, American Machinist.

NEW HAMPSHIRE

Wanted—One master machinist (outside) at $6 per diem; a competitive examination will be held May 29, 1911, for the purpose of filling the above position. For further information address "Commandant," Navy Yard, Portsmouth, N. H.

Wanted—A superintendent for a plant of 150 to 200 men, making small interchangeable work; must be thoroughly uptodate in manufacturing methods, understand piece-work system, and the use of high speed steels; a good organizer and know how to handle men; a good position is open for the right man. Box 854, American Machinist.

NEW JERSEY

Wanted in a shop near New York, not affected by strike, good gang boss on printing press machinery. Box 848, Amer. Mach.

Water wheel chief engineer, thoroughly competent designer and constructor to take full charge of latest uptodate Francis turbine wheels and governors; applicant must have extended experience; give full particulars. Box 855, American Machinist.

Foreman machinist wanted for vise work department; competent to take charge of department where small parts of large machines

are assembled; state experience and wages wanted; shop is in town near New York; not affected by strike. Box 850, AM. MACHINIST.

Toolmaker—Foreman wanted to take charge of tool room in shop thirty miles from New York, not affected by strike, employing about 150 machinists; must have knowledge of design for jigs and fixtures in addition to thorough regular tool room requirements. Box 849, AMERICAN MACHINIST.

NEW YORK

Wanted—Experienced operators for Gridley, Acme and Cleveland automatics; state experience and wages. King Sewing Machine Company, Buffalo, N. Y.

Wanted—A first class designer for special printing machinery; only those who can furnish the best of references need apply. Box 566, AMERICAN MACHINIST.

Wanted—First class operator for horizontal floor boring machine; good opportunity and permanent position for competent man looking for advancement. Box 841, AM. MACH.

Wanted—Machine-tool salesman with practical experience; unusual opportunity with rapidly growing business; state experience, age, references and salary expected. Box 823, AMERICAN MACHINIST

Steamfitter wanted to take charge of steam, water and gas piping in large factory; must also have experience as plumber and be used to handle men to the best advantage; reply in writing to Box 824, AMER. MACH.

Experienced man for milling department to take charge of from 75 to 100 men in machine shop doing general work; state age, experience, nationality and where formerly employed. Address "Cincinnati," Box 840, AM. M.

Wanted—Assistant foreman for iron machine shop; man experienced on valve work preferred; in replying state if now employed, experience, age, married or single and wages expected. Address reply, "B.P.," Box 65, Elmira, N. Y.

Wanted—Designers on special machinery; none but first class men, who possess exceptional ability and who have had wide experience need apply. Address Hanford & Barkley, 514 German Insurance Building, Rochester, N. Y.

Wanted—Superintendent for die casting factory; must be practical toolmaker, and capable tool designer experienced in the production of pressure die castings; excellent opportunity for competent man. Address P. O. Box 786, Syracuse, N. Y.

Mechanical or electrical engineer wanted by a large machinery manufacturing concern doing an international business, to take the position of treasurer and office manager of the company's home office in New York; salary three thousand per annum to commence, to be advanced to five or six thousand per annum; must be a capable man for his position, and be prepared to immediately invest fifty thousand dollars in the company's preferred stock paying 7 per cent. annual dividends quarterly; first class references given and expected. Box 803, AMER. MACHINIST.

Oxyacetylene operator wanted; high-grade man to take charge of large installation; state age, experience (both in oxyacetylene work and in former occupation), references and salary; replies will be considered strictly confidential. Box 828, AMER. MACH.

Wanted—Energetic salesmen, in all sections, now calling on machine shops, etc., to handle clean, profitable and satisfactory article as side line; state territory covered and give full details regarding selling experience; also several references; this is an excellent opportunity for right men. Box 851, AM. MA.

Wanted—An assistant foreman for the grinding department of an eastern firm doing a line of high grade automobile work; applicant must have had, and be able to hold a position of responsibility in this line of work, and to be considered must give experience, class of work and name firms worked for during past five years; state whether married or single, wages expected and when available; this is an extraordinary opportunity for a first-class executive; present employers will not be referred to if so requested. Address "Executive," AMERICAN MACHINIST.

A large, well established company, making special patent machinery with offices and factories in different countries, has a vacancy for a capable, energetic uptodate business man of unimpeachable integrity, to take charge of their main American office located in New York; must be able to invest at once $75,000 in the company's preferred stock paying quarterly dividends at the rate of 7 per cent. per annum; salary to commence, $3500 per annum, to be advanced to six thousand in the course of time; full investigation and references required and given. Box 802, AMERICAN MACHINIST.

OHIO

Draftsman wanted, having had experience with gas engines. Box 864, AMER. MACH.

Wanted—Draftsman, experienced on large machine tools, no other need apply. Box 831, AMERICAN MACHINIST.

Wanted—Foreman for assembling of motors and transmission; must be first class man; state age, experience and salary expected. Box 867, AMERICAN MACHINIST.

Wanted—Assistant chief draftsman; applicant must be thoroughly experienced in machine tool design and preferably in lathe design; in answering, give as complete an account of yourself as possible, to avoid unnecessary correspondence. Box 845, AM. MA.

Wanted—First class machinists, toolmakers, die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood and metal patternmakers, brass polishers, buffers, finishers, millwrights, hammermen and blacksmiths, who wish to increase their opportunities, to register with the free Employment Department of the National Metal Trades Association, New England Building, Cleveland, Ohio.

PENNSYLVANIA

Wanted—Draftsman on installation of refrigerating machinery; state age, experience and expected salary. Box 820, AMER. MACH.

Wanted—Neat, rapid and accurate tracer and draftsman, also several pattern makers. The Shepherd Engineering Co., Williamsport, Penn.

Diemaker on small sheet metal specialties; state experience fully and wages at first; growing concern, hence chance for advancement. Wolverine Mfg. Co., Pittsburg, Penn.

Wanted—Instructors in mechanical and electrical engineering and mechanical drawing in an eastern institution; graduates from technical schools, preferably with one or two years' practical experience. Address with references, Box 829, AMER. MACHINIST.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

RHODE ISLAND

Wanted—One foreman planner at $5.20 per diem; a competitive examination will be held May 22, 1911, for the purpose of filling the above position. For further information address "Inspector of Ordnance in Charge, Naval Torpedo Station, Newport, R. I."

Wanted—Fifty tool designers; experienced competent men in the design of jigs, fixtures, punches and dies and other special tools used in the manufacture of high grade machine parts on an interchangeable basis; apply by letter stating age, experience and salary required, as well as the date when you would be able to start if application was accepted. The Taft-Peirce Manufacturing Company, Woonsocket, R. I.

WISCONSIN

Wanted—By a firm manufacturing saw mill machinery, an experienced toolmaker with common sense ideas and good habits; married man about 35 years of age preferred. Box 783, AMERICAN MACHINIST.

Wanted at Once—Expert tool designer and machine shop foreman; thorough mechanic having experience with good machine shop practice and production; state actual experience, age, references and salary expected. Box 764, AMERICAN MACHINIST.

SITUATIONS WANTED

Classification indicates present address of advertiser, nothing else.

CONNECTICUT

Situation wanted as machine shop foreman with 25 years' experience, both light and heavy work; can furnish references. Address "G. A. H.," AMERICAN MACHINIST.

INDIANA

Experienced draftsman, mostly on machine tools, desires change. Box 821, AMER. MACH.

Foreman, at present employed, desires position as department superintendent, master mechanic or assistant superintendent; uptodate on design of jigs and fixtures in general manufacturing; thorough mechanic, good executive; technical graduate; age 30; excellent references. Box 870, AMER. MACHINIST.

MASSACHUSETTS

Machine and tool designer open for engagement July 1; thoroughly familiar with uptodate methods, capable of taking charge of drawing room or plant. Box 858, AM. MACH.

NEW JERSEY

Superintendent or assistant superintendent; 20 years' practical experience on general machine and tool work; uptodate in organization and cost systems; best of references. Box 834, AMERICAN MACHINIST.

A mechanical superintendent wishes a position with a responsible firm; capable of taking entire charge for cheap production; 20 years' experience at metal novelty and fancy hardware. Box 871, AMER. MACHINIST.

NEW YORK

Cost accountant of the highest caliber, wants high grade connection. Box 861, AM. MACH.

Salesman of creative selling power, open for connection with big proposition. Box 860, AMERICAN MACHINIST.

Toolmaker, first class dies, jigs, fixtures, expert on dies for die castings, wishes position. Box 859, AMERICAN MACHINIST.

Correspondence student, age 22, desires position in drafting room; five years' machinist experience. Box 863, AMERICAN MACHINIST.

Draftsman, 12 years' experience as machinist and toolmaker, three years as draftsman; can design tools and fixtures for rapid production. Box 869, AMERICAN MACHINIST.

Toolmaker or machinist; young man well trained to close work on tools and jigs; can work on bench and all tools; three years' experience as all-around man. Box 868, AMERICAN MACHINIST.

Expert mechanic, with inventive aptitude, and 21 years' experience on instrument making, experimental designing work and tools, four years as foreman, wishes position where ability is needed; references. Box 846, AMERICAN MACHINIST.

Superintendent, technical training, with high executive ability, wishes to change position; 15 years' experience in electro-mechanical and special machinery; first class designer, with common sense, inventive ability. Box 856, AMERICAN MACHINIST.

Graduate mechanical engineer, nine years' general experience, five years with air compressor builders, design, testing, development of electric driven units, special problems in air and natural gas compression, sales engineering and publicity work, wants responsible position with compressor builders; at present employed. Box 770, AMER. MACH.

OHIO

Toolmaker, with experience on spiral, worm and bevel gears, and the care of automatic machinery, wants position. Box 872, AM. M.

Secretary or correspondent—Young man of 27, ten years' all-around experience, desires responsible position with growing concern; five years in machine-tool business; expert stenographer. Box 826, AMER. MACH.

Position as office manager; can handle any branch of office work from accounting to shop production; ten years' experience in manufacturing business; five years in executive capacity; strong on organization and modern methods of obtaining costs; best of references. Address Box 832, AM. MACH.

PENNSYLVANIA

Toolmaker with broad training and long experience on all kinds of tools, expert on dies, wishes position. Box 862, AM. MACH.

General foreman, designer, expert on tools and dies, desires change; good technical education; 12 years of experience in adding machine, typewriter, gun and electric work; modern executive; a German who has been through the mill and can guarantee results. Box 804, AMERICAN MACHINIST.

FOR SALE

Complete set new patterns and drawings for 30- and 36-inch light radial drill, modern design. A. Pletz, 132 E. Forest Ave., Detroit, Mich.

For Sale—Gear cutters for cutting spur gears up to 2 diametrical pitch, one 48-inch Bultman machine; also one 30-inch same type, for cutting up to 2½ diametrical pitch. Address Northern Engineering Works, Detroit, Mich.

For Sale—Brass foundry and machine shop, located in large eastern city; modern equipment; last year's sales over $600,000; manufacture principally steam and plumbing specialties; will sell with or without new concrete building; great opportunity. Box 844, AMERICAN MACHINIST.

Factory for sale or lease, near Baltimore, 100,000 square feet floor space with 550 horsepower of water and 750 horsepower of steam, 50 acres land with tenements, suitable for textile, electrical, or any other line of business; good labor supply and cheap coal. Nicholson & Co., Sole Agents, Factory Brokers, 150 Broadway, New York.

Talks With Our Readers

By The Sales Manager

Does advertising pay the buyer? Read this:

NEW YORK, May 10, 1911.

AMERICAN MACHINIST,

Gentlemen:

I have read your articles on the effect of advertising from the consumers' standpoint, with considerable interest.

Having had some fifteen years' experience in utilizing advertising in co-operation with salesmen (also on a strictly mail order basis) I think possibly this letter may make clear a few facts that some buyers have perhaps not heard of.

I am going to give you a concrete example of advertising's value to the consumer—when the advertising is entrusted to educated and developed men. A moment's reflection will show the reader that the principle here involved obtains in EVERY meritorious advertised product, provided, only, the advertising is efficiently done.

This is the instance referred to:

A concern here in New York City perfected a small labor-saving machine. The man who purchased one could not save enough money by its employment to pay for it in twenty years by the work done. In brief, its sole value lay in the quicker service that the user of this machine could extend his customers.

Like many another concern, they followed the line of least resistance, viz.: they wanted other people to do for them the selling work which they should do for themselves. So they tried to interest jobbers. The jobbers catalogued them. But nothing happened—that is, comparatively nothing. The point is that this machine was a specialty. Prospective customers had negative ideas about it. It was too hard work for the jobbers' salesmen to "bring them across." Effect: stagnation.

Now this machine was really needed among the trade for which it was intended. It had the basic merit of saving delays for the customer. Thus, though the enterprise was really a failure, it was obvious that the proposition of itself, fundamentally, was all right.

The problem on the face of it was to reduce the cost of selling (jobbers were getting 40%) by increasing the volume of sales per month and cutting out the jobber. Regardless of whether or not goods are sold through jobbers or sold direct, it is axiomatic in the economics of selling that the cost of doing business depends almost entirely upon the time it takes to turn over a given volume of marketable product.

Turn over enough product in a given amount of time, and though the profit be only ½ of 1% a man can amass a fortune, provided only his market is broad enough.

To make a long story short, in this particular instance advertising, both in trade papers and by following up through the mails, was resorted to.

The net result at the end of the first year of this aggressive effort was a reduction in the selling expense from 50% to 10%. At the end of three years the article was well known and in wide use throughout the United States, and the salesmen all had a better income. Further, by the end of the second year jobbers were glad to handle the machine at a discount of 10%, and they really did sell them, if it may be called that, for the market was created. In reality, they were taking orders. The advertising had done the selling before the jobbers' salesmen broached the subject to the prospect.

Did the consumer benefit? He certainly did. Because this concern was conscientious enough and far seeing enough to put back into their product half of the saving in selling expense that this campaign effected. Actually, from the standpoint of durability, reliable service and appearance, the machine was worth twice to the consumer what it had been previous to the campaign.

There is a point here for consumers everywhere to ponder over, which is simply, that the manufacturer of an advertised product must constantly put more value into it, because the only hope of the maker of an unadvertised product to compete with him is to make HIS product better. Thus, a natural law operates in the interest of the consumer—Emerson would call it Compensation.

And note this: the manufacturer of an advertised product who does his advertising properly can put more value into his product than his competitor, because advertising, when efficiently done, does reduce selling cost and does enable the manufacturer to actually give his purchasers a NEW STANDARD of excellence in quality and service.

Very truly yours,

E. H. White.

NELSON GOODYEAR, Inc.

* * *

Only reliable products can be continuously advertised.